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THESIS

APPLICATION OF AN INTERACTIVE COMPUTER MODEL
TO ANALYZE THE DISTRIBUTION OF
U.S. NAVY WARFARE SPECIALISTS
AMONG GENERALIST BILLETS

by

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December 1991

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Application of an Interactive Computer Model to Analyze the Distribution of U.S. Navy Warfare Specialists Among Generalist Billets

by

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ABSTRACT

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I. INTRODUCTION

> Manpower planning...the attempt to match the supply of people with the jobs available for them.[Ref. 1]

Perhaps one of the most challenging manpower planning problems facing U.S. Navy personnel managers today involves the distribution of warfare specialists among the cadre of billets open to all unrestricted line officers (URL). These "generalist billets" are somewhat of a thorn in the community manager's side. Just as he is trying to send his warfare specialists to professionally meaningful billets, the placement officer, responsible to the command for filling generalist billets which are often far removed from any operational warfare specialty, is attempting to draw on the community manager's pool of warfare talent. These two processes are often in complete contradiction. If the community manager had his way, no warfare specialists would ever fill such generalist billets. If the placement officer had his way, all the generalist billets would be filled by warfare specialists. As a result, any particular warfare community would just as soon have the other communities fill most of the available generalist billets. It is a problem that has historically received the lowest management priority, as the "needs of the Navy" dictate, of course, that a community's first priorities are to fill its own discrete billets and maintain a rewarding professional career path for its warfare specialists. Any surplus of warfare specialists are then, somewhat reluctantly, made available to the generalist arena.

The number of warfare specialists available for required generalist billets is not effectively being managed or modeled. The need exists for a more effective tool to better plan for future manpower requirements with respect to the distribution of U.S. Navy warfare specialists among generalist billets. For example, after filling required submarine billets in fiscal year 1990, the submarine community was unable to fill their share of available Lieutenant generalist billets. Yet at the rank of Captain, there were far too many submariners available for such billets.[1] Such a situation adversely impacts the other warfare communities who have to send a larger number of their personnel to fill these junior billets, and may not have generalist billets available for their more senior personnel.

The purpose of this thesis is to demonstrate a modeling tool, effective in the analysis of the distribution (or billet-fill requirements) of warfare specialists among generalist billets. This thesis will analyze the present, "status-quo", distribution utilizing current input parameters. This "status-quo" analysis will identify any future shortfalls or excesses and analyze their possible impact within and

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[1]Information provided by Officer Allocation and Distributable Manning Projection Branch (NMPC-454).

between warfare communities and their future requirements. Additionally, alternative "fair-share" distributions among warfare communities will be analyzed, compared with the "status-quo", and the possible impact of such alternatives will be investigated.

For purposes of this thesis, "warfare specialists" are defined as Unrestricted Line officers qualified in one of the following four warfare-specific communities:

111X Surface Warfare

112X Submarine Warfare

131X Naval Aviation (pilot)

132X Naval Aviation (Naval Flight Officer)

The Special Warfare (113X) and Special Operations (114X) communities, although "warfare specialists", are ignored for the purposes of this work. These communities are extremely small in relation to the four major warfare specialties. After filling requirements within their own communities, the 113X and 114X communities have negligible impact on the overall distribution of the four major warfare specialties among generalist billets.

"Generalist Billets" are defined as follows [Ref. 2]:

1050 billets: Unrestricted Line officer billet requiring an officer qualified in any one of the warfare specialties (LT and above)

1000 billets: Unrestricted Line officer billet which may be filled by an appropriately skilled and experienced officer

Essentially, the difference between 1000 and 1050 billets is that the latter may be filled by General URL officers as well, whereas the former must be filled by only warfare specialists.

Bartholamew and Forbes [Ref. 1] present two major areas which allow for the proper "statistical treatment", or analysis, of manpower modeling. The first, aggregation, may be defined as the process through which one gathers objects together into a mass or sum so as to constitute a whole. Rostker refers to aggregation as "the basic building block in a ... human resource model"[Ref. 3]. Only through proper aggregation can personnel be described into well-defined categories. Rostker further emphasizes that "...the usefulness of a model is directly related to the appropriateness of the aggregation scheme"[Ref. 3]. Further justification for the aggregation scheme utilized in this thesis will be presented in a subsequent discussion of model inputs and implementation.

The second fundamental property lending itself to a proper analysis is the uncertainty inherent to any social and economic environment. Coupled with the unpredictability of human behavior, such uncertainty leads to the application of probabilistic concepts. Utilizing probabilities of transition from one state, or billet type, into a follow-on state, this thesis will utilize an "expected value" analysis to model the career flow of warfare specialists through a system of activities (billets) for a given number of tours.

Bartholamew and Forbes [Ref. 1] further outline two basic purposes which analysis serves in manpower planning:

i) *Description*...of the system in numerical terms and summarizing the results so as to be easily understood. Through careful examination of the present system, the analyst is able to draw attention to possible future problems (eg: manning shortfalls or excesses).

ii) *Forecasting*...not what *will* happen, but what *would* happen if the assumed trends, or initial parameters, hold. Forecasting provides a guide to management action required to achieve a desired objective. In this capacity, forecasting provides a tool for evaluating varying policies and analyzing their impact.

This thesis will parallel these two objectives of manpower analysis. The present system by which warfare specialists are distributed among generalist billets will be thoroughly described, drawing attention to present and future problems inherent in the "status-quo"; a manpower modeling program will be utilized to forecast future personnel distributions to answer typical "what if...?" questions; alternative system dynamics will be investigated to analyze the management action necessary for desired effects; and finally, new management policies will be evaluated and compared.

II. NAVY OFFICER MANPOWER PLANNING SYSTEM: POLICIES AND PROCEDURES

Navy manpower planning involves an intricate network of echelons within the overall Navy structure. The Chief of Naval Operations (CNO) is ultimately responsible for the direction and coordination of overall manpower planning for the various warfare communities. Navy Officer Manpower Planning System objectives, as outlined in the Manual of Navy Total Force Manpower Policies and Procedures [Ref. 4] include the following:

- Provide a system for the aggregation of manpower requirements information at the various levels...to support and justify Navy manpower requirements during all stages of the Planning, Programming, and Budgeting System.

- Relate support manpower requirements within the shore establishment to the changing demands of the operating forces.

- Provide reliable planning information to personnel inventory managers...so they may assess the feasibility and impacts of manpower management actions.

To ensure these objectives are obtained, several subordinate commands are responsible to the CNO for various aspects of the manpower planning system. Each specific warfare community has an Assistant Chief of Naval Operations (ACNO) who serves as their "community sponsor". For the three warfare specialty communities of interest to this thesis, these are the ACNO for Undersea Warfare (OP-02), ACNO for

Surface Warfare (OP-03), and ACNO for Air Warfare (OP-05). The community sponsors represent their community at the flag level for general, overall operations and administration.

The development and authorization of Navy manpower requirements involves a complex annual cycle within the Department of Defense's Planning, Programming, and Budgeting System (PPBS). Based upon guidance provided by the Joint Chiefs of Staff and the Secretary of Defense, the Navy develops and submits force and resource recommendations with rationale and risk assessment. That is, first the required forces are determined; then, manpower requirements necessary to support the planned forces are determined.

The difficulty in manpower planning lies in the necessity to minimize requirements while achieving optimum utilization so as to ensure the Navy's maximum combat readiness. Navy manpower managers must balance cost and manpower requirements with the maintenance of a professional career path which systematically develops qualifications while maintaining a motivated and dedicated officer corps. Figures 2.1, 2.2, and 2.3 illustrate the general guidance provided surface, subsurface, and aviation officers [Ref. 5], respectively, with respect to the typical career path required of their warfare community. Not intended as a representation of an individual's "ideal" career path, these professional development paths outline a "typical" sequence of types of

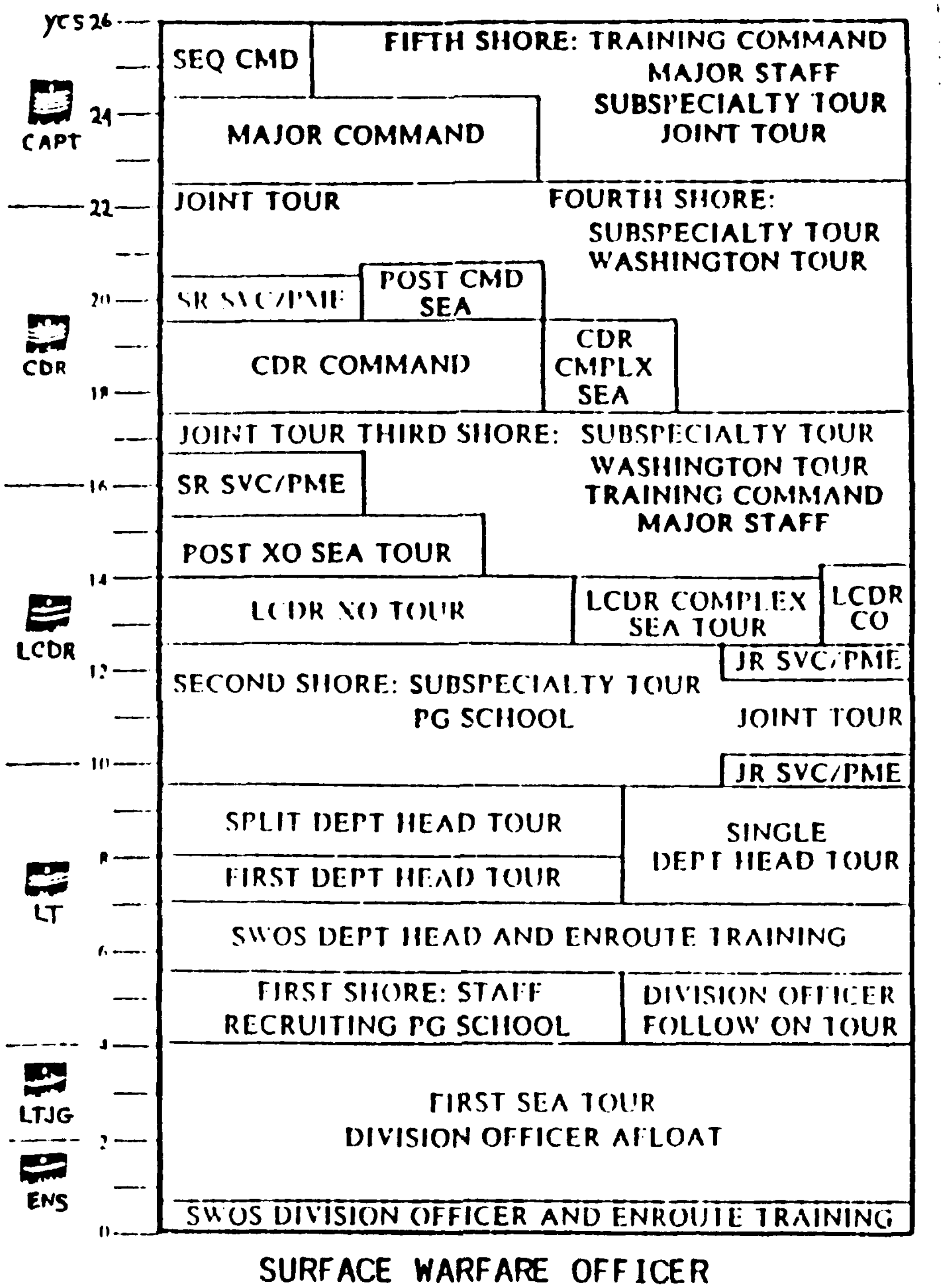
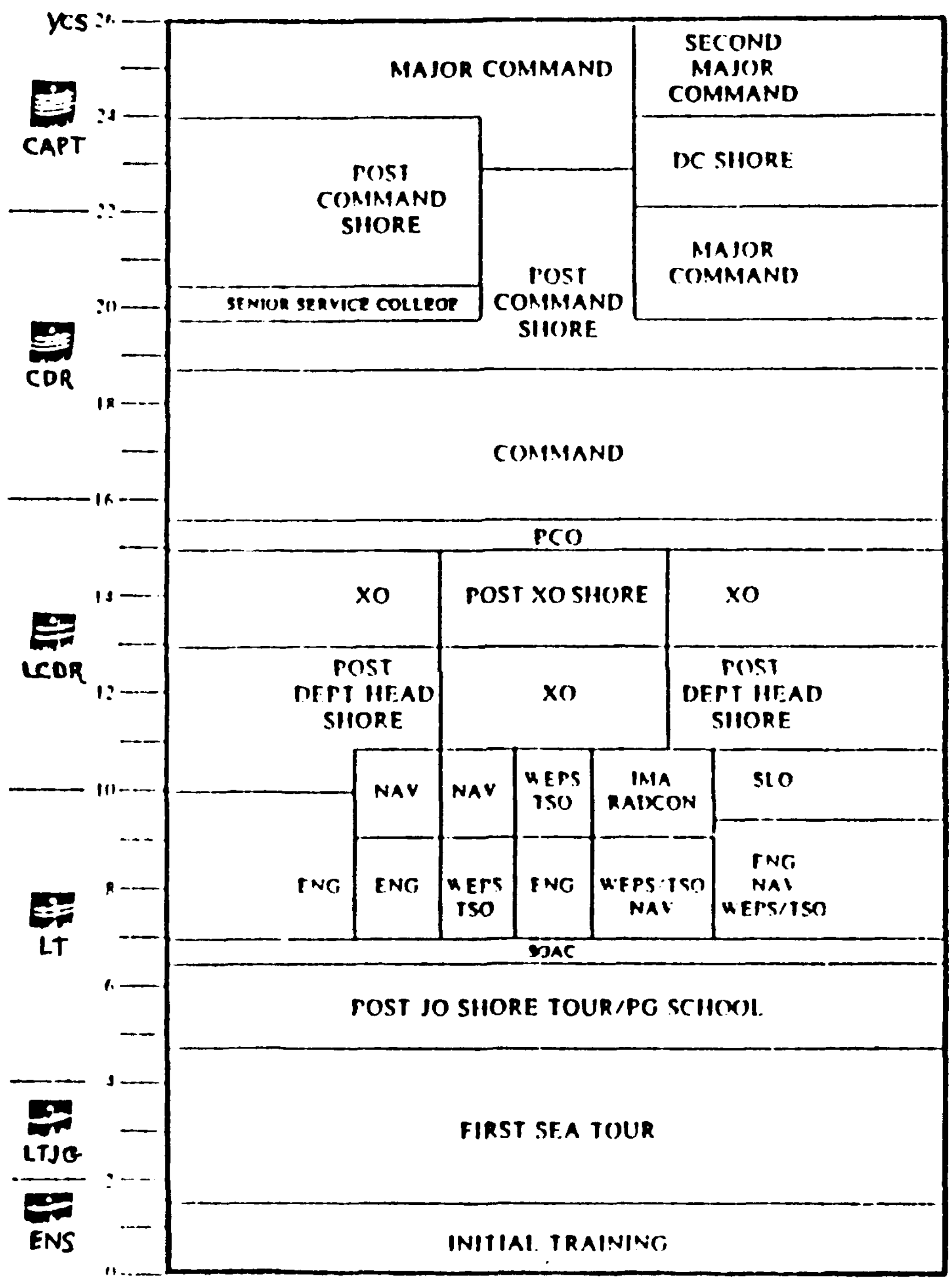


Figure 2.1 Surface Officer Professional Development Path



NUCLEAR SUBMARINE OFFICER

Figure 2.2 Submarine Officer Professional Development Path

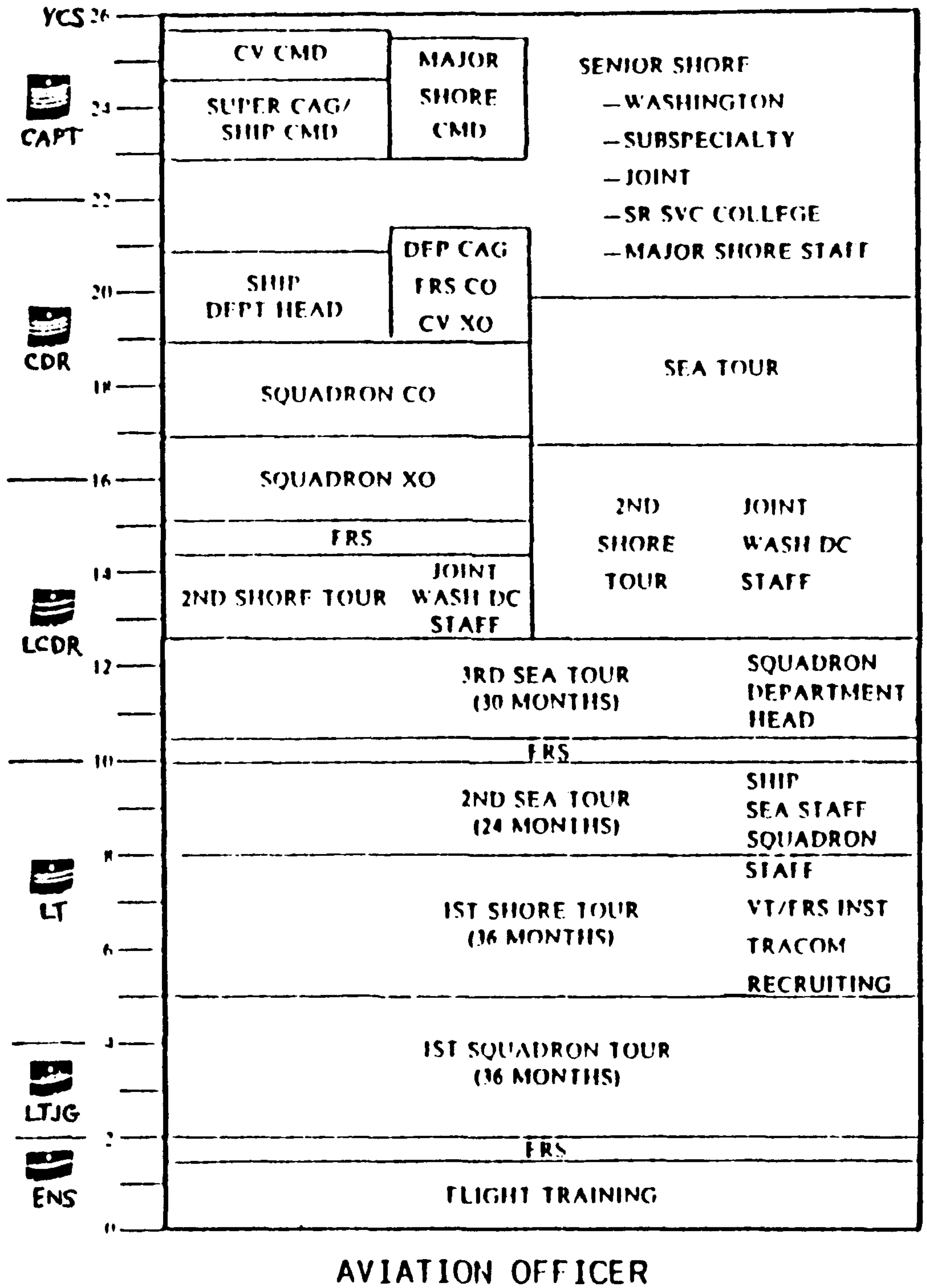


Figure 2.3 Aviation Officer Professional Development Path

billets which that warfare specialist should experience throughout a well-rounded career. Certainly, the timing and sequence of specific tours must allow enough flexibility to enable Navy manpower managers to achieve their overall objectives.

Duty assignments within warfare communities include operational and non-operational billet requirements. Operational billets are generally sea tours, aviation squadrons, and operational (sea) staffs as outlined in the Professional Development Paths of Figures 2.1 through 2.3. Non-operational billets include duty both in and out of a warfare specialty (generally ashore) in the areas of support facilities, training, and administrative staffs. As stated in OPNAVINST 1000.16E [Ref. 4], use of 1050 and 1000 billets provides manpower planners the maximum flexibility in managing unrestricted line officer assignments and maximizes the opportunity for matching specific billet requirements with personnel qualifications. However, these generalist billets are unique in that their requirements are shared among several different communities. This presents a unique manpower planning problem for those communities. Involved in this aspect of manpower planning are the Director, Military Personnel Policy Division (OP-13), and the Assistant Commander for Distribution, Chief of Naval Personnel (PERS-4).

The primary responsibility of OP-13 is the development of personnel policies and plans in support of the total Navy forces. Similarly, PERS-4 is primarily responsible for the maintenance and management of personnel inventories through the distribution process. Under OP-13, each warfare community is represented by a "community manager" who works with the Distribution Branch (PERS-4), coordinating manpower plans and policies for their respective communities. OP-13 community managers and PERS-4 are involved in the interactions between warfare communities and the impact of personnel policies relating to individual communities as well as their inter-relationships.

With respect to the distribution of warfare specialists among generalist billets, OP-13's interest is in the broad aggregate of personnel available to fill required billets. OP-13 establishes policy looking at the distribution of officers with respect to what they project steady-state to be. They look well into the future at what projected inventories can be expected of populations of interest, such as, a specific community, a year group, etc. PERS-4, on the other hand, is interested in forecasts involving various aspects of specific officer categories in the near-term, such as the current or next fiscal year.

In 1981, the Navy approved a methodology called "Balanced Force", which, among other things, was developed to allocate generalist billets among the warfare communities. The Balanced Force methodology took authorized designator-discrete sea duty billets and, based on an ideal community sea/shore rotation, computed the number of shore billets required for that community. Authorized discrete shore billets were then subtracted from this required authorization and the remainder was the required generalist (1050/1000 billet) authorizations for that community.[Ref. 6]

Balanced Force is essentially a steady-state model utilized by OP-13 community managers. By looking at billets in a gross sense, Balanced Force looks at a community's overall, or aggregate, ability to fill generalist billets. The inherent problem in this methodology is that some warfare communities are unable to fill certain year-group/rank requirements while other ranks are in excess (e.g. the submarine example referred to in the Introduction).

Although Balanced Force still has applications in other areas of manpower planning, as early as 1988 it was realized by Navy manpower planners that the Balanced Force methodology contained severe limitations in the framework of a no-growth environment. Required shore duty billets to support an ideal sea/shore rotation exceeded programmed authorizations. While sea billet authorizations were growing, total manpower strength was being cut or capped, resulting in a reduction in shore billets authorized.[Ref. 7]

In 1989 a new method of distributing warfare specialists among generalist billets was developed which allocates authorizations based on a percentage of the community available after all discrete billet requirements are filled.

The Navy Manning Plan for Officers (NMP-O) provides total force manning considerations reflecting the realities of the distribution process. [Ref 7] Among the objectives of NMP-O is the prediction of generalist billet allocation among warfare communities. NMP-O provides a near-term look at a community's excesses above discrete billet requirements to predict the community's ability to fill a requisite share of 1050/1000 billets over the current fiscal year.[Ref. 8]

The problems with NMP-O are that it is too near-sighted and narrow-minded. It does not allow Navy manpower planners the flexibility required. The guidance given Navy manpower planners with respect to the distribution of Warfare Specialists among generalist billets remains an art based on the present and perceived future health and welfare of a community. It is basically a subjective process resulting from inter-community politics and the personalities involved.

The tools utilized by Navy manpower planners to distribute warfare specialists have evolved from the long-ranged, broad scope of "Balanced Force" to the near-term, narrow view of NMP-O. Required is a repeatable methodology that allows individual community managers of OP-13 and the distribution planners of PERS-4 to talk to each other in the same language over several years' forecasts.

The following analytical tool provides manpower planners a dynamic flexibility to enable them to more easily test alternative policies and procedures with respect to the distribution of warfare specialists among generalist billets.

III. MODEL DEVELOPMENT AND IMPLEMENTATION

A. HISTORICAL BACKGROUND

In the late 1980's, Professor P.R. Milch [Ref. 9], constructed a computer model to analyze the distribution of Naval officers. A user-friendly interface was developed by Johnson [Ref. 10], and Drescher [Ref. 11] subsequently reorganized the model's functions and provided a more thorough documentation of its sub-functions. These latter efforts demonstrated the use of the model, called FORECASTER, in the analysis of joint duty assignments pertaining to the Navy Surface Warfare and Aviation Warfare officer communities, respectively.

More recently, Milch [Ref. 12] revised the mathematical core so as to make the model much more efficient and faster, thus enhancing its usability.

B. MODEL DESCRIPTION

Presented here is a functional description of the current version of FORECASTER. It is an inter-active, user-friendly program written in APL that can be run on any IBM-compatible PC with APL software installed.

FORECASTER is a "cross-sectional" model which utilizes "fractional-flow analysis" to effectively model personnel flow through a system of activities (billet types) versus tour number. An officer's career is modeled as a sequence of tours. Grinold and Marshall [Ref. 13] describe a "cross-sectional" model as one in which the knowledge of historic personnel movement prior to a given time, t, is not required to describe how the system changes from time t to t+1; only the "cross-sectional" structure of the system at a given point in time is required. FORECASTER uses a matrix of "incumbents" data (described in detail later) as just such a cross-sectional snapshot of the number of officers in each activity/tour number position at time zero. Utilizing a series of transition probability matrices, the model uses deterministic (or expected value) assumptions, to represent the "fractional-flow" of personnel through the career system of tours. These underlying assumptions and the justification of this methodology will be outlined in a subsequent discussion of the development of the transition probability matrices.

FORECASTER provides the user with the ability to easily change inputs, and to modify, save, and manipulate data files. This capability enables the user to analyze proposed policies, perform comparative analyses, and investigate their implications. The model outputs the future distribution of personnel for the user-defined system. For given input parameters, the output is a distribution of the number of personnel available (or required) at some future time in each activity/tour number position.

C. MODEL INPUTS AND SETTINGS

The main menu of FORECASTER consists of the following inputs and settings:

- (N)ame of Activities
- (L)ength of Tours
- (A)ccessions
- (I)ncumbents
- (T)ransition Probabilities
- (B)illet Data (HARD/SOFT)
- (G)o and Run Model with Current Inputs
- (R)eview Previous Output/Analysis
- (P)rinter Turned On or Off
- (S)ave Input Values
- (E)xit the Program

A general description of each of these items follows. A more thorough explanation of the development of each input parameter will be addressed in a subsequent section on model implementation.

1. (N)ame of Activities

Activities, or billet types, are the building blocks by which the user defines the community, or communities, to be modeled. Activities must be mutually exclusive and exhaustive to ensure that every member of the population modeled is counted once, and only once. FORECASTER allows the user to add, delete, and change activities, thus providing flexibility in application.

Table 3.1, below, defines the activities modeled in this application of FORECASTER, which includes three distinct warfare specialties.

TABLE 3.1
ACTIVITY DEFINITIONS

1.	ED/TRNG	Education and Training billets
2.	DISCRT SEA	Discrete sea duty billets; the officer's designator matches the billet distribution code
3.	DISCRT SHR	Discrete shore billets; same match as above
4.	1300 BILLET	Billets which require any Naval Aviator: 1310, 1320, or 1300
5.	1050 (111X)	A 1050 billet currently filled by a Surface Warfare Officer
6.	1050 (112X)	A 1050 billet currenly filled by a Submarine Officer
7.	1050 (131/2)	A 1050 billet currently filled by a Naval Aviator (pilot or NFO)
8.	1000 (111/6)	A 1000 billet currently filled by a Surface Warfare Officer or trainee (116X designator)
9.	1000 (112/7)	A 1000 billet currently filled by a Submarine Officer or trainee (117X designator)
10.	1000 (13XX)	A 1000 billet currently filled by a Naval Aviator
11.	1000 (1100)	A 1000 billet currently filled by a General Unrestricted Line Officer (1100 designator)

2. (L)ength of Tours

Tour lengths are defined as the number of quarters for each duty assignment, by activity and tour number. Tour lengths are arranged in a matrix which has as its row dimension the number of activities modeled and its column dimension the number of tours in the system. This thesis utilizes the eleven activities described above and simulates the typical Navy officer career from Ensign to Captain over a sequence of eleven tours. The tour length matrix is therefore an 11 x 11 matrix, each cell containing the duration of that assignment.

3. (A)ccessions

Accessions are the number of personnel entering the system per given time interval. FORECASTER allows for the accession of personnel at any tour number (e.g.: lateral transfers, or recruits into tour numbers greater than "1"). This thesis utilizes accessions only into the first tour, which is a realistic assumption with respect to the communities modeled.

Accessions data is in the form of a matrix which has the dimensions of number of activities by number of tours (11 x 11). Since this thesis allows accessions only into the first tour, only the first column of the accessions matrix has non-zero entries.

4. (I)ncumbents

Incumbents are the total number of personnel in each activity/tour number at time zero. The incumbents matrix is an 11 x 11 matrix (number of activities by number of tours) and provides the "cross-sectional" snapshot for system initialization.

5. (T)ransition Probabilities

Transition probability refers to the probability of transiting from one assignment to another, when proceeding from one tour to the next. This data is arranged in a three dimensional array consisting of ten 11 x 11 matrices (each, activities versus activities). The first matrix contains the probabilities of transiting from activities in tour number 1 into activities in tour number 2; the second matrix does the same from tour 2 to 3; and so forth, through the tenth matrix, from tour 10 to 11. Personnel are then assumed to leave the system modeled.

6. (B)illet Data (HARD/SOFT)

Billet data refers to those "hard" billets which must be filled by a specific designator, and "soft" billets which can be filled by any of several designators. This option is utilized in the analysis of discrete and non-discrete billet assignments within a single community.

7. (G)o and Run Model with Current Inputs

Model run is initiated by selecting this menu setting. An interactive function first queries the user as to whether or not a warning is desired pertaining to any data inconsistencies. The model then asks the user to select the number of quarters desired to forecast into the future, and initiates the forecasting procedure.

FORECASTER output is the expected numbers of officers the requested number of quarters into the future, presented in an 11 x 11 matrix of activities versus tour number. The user is then prompted as to a number of options available to analyze the results. The model also provides the option of replacing the incumbents data with the newly forecasted distribution.

8. (R)eview Previous Output/Analysis

This capability enables the user to easily perform basic comparative analyses between subsequent model runs.

9. (P)rinter Turned On or Off

Selection of this setting allows the user to utilize an attached printer.

10. (S)ave Input Values

This capability allows the user to save the current input parameters by either overwriting the current file or maintaining the current file in its present form and creating a new file under a new file name.

11. (E)xit the Program

If this option is selected, the user is reminded as to the availability of the Save Options before exiting the model.

D. MODEL IMPLEMENTATION, ASSUMPTIONS, AND SCOPE

1. Activities

This thesis is the first application of FORECASTER to multiple communities simultaneously. In effect, the surface, sub-surface, and aviation communities are treated as a single community of warfare specialists. Education/Training billets and both sea (operational) and shore billets involving discrete warfare requirements are, therefore, treated in the aggregate. However, in order to analyze any one specific community with respect to generalist billets, it was necessary to categorize these billets by the type of officer currently assigned.

Additional categories involving "1300 Billets" and General Unrestricted Line officers (110X designator) filling "1000" billets are included due to their impact on the population modeled. "1300" billets comprise almost 20% of all aviation billets available and are effectively a general billet type unique to the aviation community. The aviation community also includes a "130X" officer designator. Officers with this designator comprise approximately 1% of the community and may be assigned to both generalist billets and to "1300", "1310", and "1320" designated billets, if otherwise qualified. Although the General URL community accounts for only about 9% of the population modeled, they account for almost 70% of the officers serving in "1000" billets.

Officers having completed initial warfare training are the ones assigned to warfare-discrete and generalist billets. Activities were defined to encompass this population. The first tour is therefore defined as the first operational tour following initial warfare training. For the surface and sub-surface communities, this refers to the completion of Surface Warfare Officer School (Basic), and Submarine Officer Basic Course (SOBC), respectively. These officers remain designated "116X" (surface) and "117X" (sub-surface) trainees until the completion of their warfare qualification requirements and the requisite experience. This often involves up to two years and can consist of more than one operational (sea) tour. Only then are they designated "111X" or "112X" warfare specialists. For this reason, activities involving the surface and sub-surface communities include these trainees. "1110" and "1120" discrete billets are, in fact, defined as billets requiring either the warfare specialist or an officer in training for the warfare specialty.

Aviators are designated warfare specialists upon completion of flight training ("1310" or "1320"; pilot or NFO, respectively). The first tour for the aviation community is therefore defined as the first squadron tour following flight training and the initial Fleet Replenishment Squadron (FRS) tour. Aviator trainees are therefore not included in the population modeled.

Activities used in this application are defined in Table 3.1 in Section III C.

2. Tour Lengths

As seen in the Professional Development Paths of Figures 2.1 through 2.3, there is very little consistency in the lengths of tours among, or even within, communities. Therefore, associating a specific tour length with an activity/tour number proved to be a complex task.

The issue of tour lengths was addressed by a Navy Study Group which reported on "The Skelton Panel on Military Education Recommendation"[Ref. 14]. In order to utilize a model developed specifically for their study, it was necessary to quantify tour lengths among the various warfare communities and their sub-communities (e.g. pilots and NFO's of different aircraft types). Tables A-1 through A-7, Appendix A, represent the results of the Navy Study Group, consisting of various career tours and the associated tour lengths for each community of interest. This data was compared with the corresponding Professional Development Paths of Figures 2.1 through 2.3 to quantify tour lengths with respect to tour numbers. Due to the flexibility in career paths within and among warfare specialties, and the differing tour lengths among communities at similar career points, this was a process where some subjective judgement using general familiarity with the communities modeled was also needed. The resulting matrix of "Current Tour Lengths" is shown in Table 3.2.

TABLE 3.2
TOUR LENGTHS MATRIX

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG		9	8	8	8	6	4	4	4	4	4
2. DISCRT SEA	12	10	10	8	8	8	8	8	8	7	7
3. DISCRT SHR	4	12	12	11	11	11	10	9	10	10	11
4. 1300 BILLET	4	12	12	12	12	12	10	10	10	10	10
5. 1050 (111X)		8	8	8	8	8	8	10	10	10	10
6. 1050 (112X)		10	10	8	8	8	8	10	10	10	10
7. 1050 (131/2)		12	12	12	12	12	10	12	10	10	12
8. 1000 (111/6)	4	8	8	8	8	10	10	12	10	12	12
9. 1000 (112/7)	4	14	12	10	8	8	8	8	10	8	12
10. 1000 (13XX)	4	12	12	12	12	12	10	10	10	12	12
11. 1000 (1100)	8	10	10	10	10	10	10	10	10	10	10

3. Accessions

The accessions matrix, Table 3.3, represents the number of "Current Accessions", or entries into the system during a quarter. Because this thesis assumes accessions only into the first tour, only the first column contains non-zero entries.

Here, these numbers were computed as the ratio of the first column of the incumbents matrix (see below) and the first column of the tour lengths matrix (Table 3.2, above). Under the assumption of steady-state, this is the number of personnel required each quarter to fill the vacancies created by those transiting from tour number 1 to tour number 2. These "movers" will be explained in more detail later.

TABLE 3.3
ACCESSIONS MATRIX

CURRENT ACCESSIONS

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG											
2. DISCRT SEA	358										
3. DISCRT SHR	13										
4. 1300 BILLET	289										
5. 1050 (111X)											
6. 1050 (112X)											
7. 1050 (131/2)											
8. 1000 (111/6)	6										
9. 1000 (112/7)	2										
10. 1000 (13XX)	6										
11. 1000 (1100)	30										

4. Incumbents

The "Current Incumbents" matrix was generated from the Navy Officer Master File (OMF) with the help of the Defense Manpower Data Center (DMDC), Monterey, CA. Billet designators were matched with officer designators where necessary, thus forming the activities of interest. The Past Duty Station (PDS) counter was utilized to determine the tour number to which the officer was currently assigned.

The Navy OMF does not increment an officer's PDS counter for education or training billets. It was therefore necessary to manually increment this counter to account for postgraduate education, War College, etc. This gave a more accurate count of the tour number to which the officer was currently assigned.

The OMF does accurately reflect if an officer is currently assigned to an education or training billet. In order to exclude surface and sub-surface officers who have not yet completed initial warfare training and aviation officers who have not yet completed their first FRS tour, officers in education and/or training billets in tours 1 and 2, as reflected on the OMF, were assumed to be in initial warfare training and were not counted in the incumbents data.

Utilizing a hierarchy of officer and billet designator matches, the total number of officers filling the defined activities for a given tour number was determined. FORECASTER assumes a uniform distribution of personnel with respect to their "experience level" within each assignment. For example, for an activity/tour number of tour length four quarters, with 100 incumbents, it is assumed that 25 are in the first quarter of their tour, 25 are in their second quarter, etc.

The Incumbents Matrix obtained through DMDC is presented in Table 3.4.

TABLE 3.4
INCUMBENTS MATRIX

CURRENT INCUMBENTS

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG			895	467	255	203	144	175	98	46	14
2. DISCRT SEA	2149	2370	882	427	507	487	322	351	359	182	93
3. DISCRT SHR	51	672	490	228	126	186	160	377	372	142	91
4. 1300 BILLET	2311	3081	1777	1032	765	795	556	879	371	82	64
5. 1050 (111X)		47	44	10	3	17	11	26	68	45	25
6. 1050 (112X)		29	7	1	2	2	2	14	4		
7. 1050 (131/2)		18	22	27	19	51	33	81	68	17	13
8. 1000 (111/6)	25	128	177	73	43	43	44	76	183	119	76
9. 1000 (112/7)	6	79	23	18	7	11	10	50	22	2	2
10. 1000 (13XX)	22	160	76	82	50	178	166	256	165	41	25
11. 1000 (1100)	239	515	373	332	230	141	110	156	91	19	11

5. Transition Probabilities

When the overall aim of an analysis is a system which is stationary, or in steady-state, it is realistic to utilize assumptions of "stationarity". Bartholomew and Forbes [Ref. 1] define stationarity as a "set of circumstances...(in which)...the net effect of all movements is one of 'no change'". The ideal situation would be if the number of personnel in each assignment (activity versus tour number) did not change from one quarter to the next, or at least remained relatively constant over time. The implication is <u>not</u> that there is no movement, but rather that the net effect of all movements is one of no change.

The initial development of the transition probabilities assumes a steady-state system. This assumption implies that the total number of individuals in a particular cell remains constant and therefore the number entering the cell must equal the number exiting.

In reality, more often than not, this steady-state assumption is not valid. Periodically the number of personnel entering a particular cell will not equal the number exiting and thereby the total number within the cell will change.

For example, Table 3.5 is a matrix of "Movers", which represents the "Current Incumbents" matrix (Table 3.4) divided by the "Current Tour Lengths" matrix (Table 3.2). Under the steady-state assumption, the total number of personnel leaving one tour during a quarter either move into the vacancies created by the movement of those leaving the follow-on tour, or attrite. Table 3.5 shows that for both tours 5 and 7, the follow-on tours contain more personnel, which would seem to imply a continuation rate greater than 1.

TABLE 3.5
"MOVERS"

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0	0	111.9	58.4	31.9	33.8	36	43.8	24.5	11.5	3.5
2. DISCRT SEA	179.1	237	88.2	53.4	63.4	60.9	40.3	43.9	44.9	26	13.3
3. DISCRT SHR	12.8	56	40.8	20.7	11.5	16.9	16	41.9	37.2	14.2	8.3
4. 1300 BILLET	577.8	258.8	148.1	86	63.8	66.3	55.6	87.9	37.1	8.2	6.4
5. 1050 (111X)	0	5.9	5.5	1.3	0.4	2.1	1.4	2.6	6.8	4.5	2.5
6. 1050 (112X)	0	2.9	0.7	0.1	0.3	0.3	0.3	1.8	0.4	0	0
7. 1050 (131/2)	0	1.5	1.8	2.3	1.6	4.3	3.3	6.8	6.8	1.7	1.1
8. 1000 (111/6)	6.3	16	22.1	9.1	5.4	4.3	4.4	6.3	18.3	9.9	6.3
9. 1000 (112/7)	1.5	5.6	1.9	1.8	0.9	1.4	1.3	6.3	2.2	0.3	0.2
10. 1000 (13XX)	5.5	13.3	6.3	6.8	4.2	14.8	16.6	25.6	16.5	3.4	2.1
11. 1000 (1100)	29.9	51.5	37.3	33.2	23	14.1	11	15.6	9.1	1.9	1.1
TOTAL:	812.9	646.5	464.6	273.1	206.4	219.2	186.2	282.3	203.8	81.6	44.8

It is emphasized that "movers" (incumbents divided by tour lengths) are a reflection of separate, individual cohorts, originating at various times in the past, applied to today's tour lengths. Due to past differences in accessions and/or attrition, remnants of cohorts within the incumbents' cross-sectional snapshot can, and do, vary considerably. Tours 5 through 8 reflect such anomalies which are the result of the system's previous departure from steady-state. Intuitively, we know that the system being modeled is almost never in steady-state and it is therefore not surprising that occasionally there may be more personnel serving in later tours than in earlier ones. In order to develop valid continuation rates, tour lengths were adjusted, as shown in Table 3.6 below, and applied to the original incumbents data of Table 3.4.

TABLE 3.6
ADJUSTED TOUR LENGTHS

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0	9	8	8	6	6	4	8	4	2	2
2. DISCRT SEA	12	10	10	8	8	8	6	10	9	7	7
3. DISCRT SHR	4	12	12	11	11	11	10	14	11	10	11
4. 1300 BILLET	4	12	12	12	10	12	9	15	12	8	8
5. 1050 (111X)	0	8	8	8	8	8	8	10	10	10	10
6. 1050 (112X)	0	10	10	8	8	8	8	8	10	10	10
7. 1050 (131/2)	0	12	12	12	10	12	10	15	10	8	8
8. 1000 (111/6)	4	8	8	8	8	10	10	12	12	12	12
9. 1000 (112/7)	4	14	12	10	8	6	8	8	10	8	12
10. 1000 (13XX)	4	12	12	12	12	12	10	10	10	12	12
11. 1000 (1100)	8	10	10	10	10	10	10	10	10	10	10

Applying these adjusted tour lengths to the original incumbents data, results in flows from which it is possible to compute base transition probabilities. The result is a matrix of "adjusted movers", displayed in Table 3.7.

TABLE 3.7
"ADJUSTED MOVERS"

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0	0	111.9	58.4	42.5	33.8	36	21.9	24.5	23	7
2. DISCRT SEA	179.1	237	88.2	53.4	63.4	60.9	53.7	35.1	39.9	26	13.3
3. DISCRT SHR	12.8	56	40.8	20.7	11.5	16.9	16	26.9	33.8	14.2	8.3
4. 1300 BILLET	577.8	256.8	148.1	86	76.6	66.3	61.8	58.6	30.9	10.3	8
5. 1050 (111X)	0	5.9	5.5	1.3	0.4	2.1	1.4	2.6	6.8	4.5	2.5
6. 1050 (112X)	0	2.9	0.7	0.1	0.3	0.3	0.3	1.8	0.4	0	0
7. 1050 (131/2)	0	1.5	1.8	2.3	1.9	4.3	3.3	5.4	6.8	2.1	1.6
8. 1000 (111/6)	6.3	16	22.1	9.1	5.4	4.3	4.4	6.3	15.3	9.9	6.3
9. 1000 (112/7)	1.5	5.6	1.9	1.8	0.9	1.4	1.3	6.3	2.2	0.3	0.2
10. 1000 (13XX)	5.5	13.3	6.3	6.8	4.2	14.8	16.6	17.1	13.8	2.1	3.1
11. 1000 (1100)	29.9	51.5	37.3	33.2	23	14.1	11.0	11.1	9.1	1.9	1.1
TOTAL:	812.9	646.5	464.6	273.1	230.1	219.2	205.8	193.1	183.5	97.3	51.4

Base transition probabilities for the "status-quo" were calculated utilizing a proportional distribution among feasible follow-on tours for each activity/tour number among the "adjusted movers" of Table 3.7 (above).

Under the steady-state assumption, the basic equation for $P_{ij}^{(k)}$, the probability of transiting from activity i in tour number k, to activity j in tour number k+1, is[2]:

$$P_{ij} = m_j/M_i \quad \text{for } i = 1,\ldots,11 \text{ and } j = 1,\ldots,11,12, \qquad (1)$$

[2] For simplicity, the superscript "k" has been omitted. Note that subsequent definitions depend on tour number "k" as well.

where,

m_j = the number of personnel entering activity j in tour number k+1,

M_i = the total number of feasible billets available in tour number k+1 for personnel entering from activity i in tour number k.

An additional activity number 12, in tour k+1, is used to account for personnel attriting the system after completing tour k. The number of such personnel is:

$$m_{12} = n - m = \text{total number of attrites,} \qquad (2)$$

where,

$n=\sum_{i=1}^{11} n_i$ = the total number of personnel exiting out of tour number k.

$m=\sum_{i=1}^{11} m_j$ = the total number of personnel required to enter tour number k+1.

In addition, by defining the set S_i, for all i, such that,

S_i = {activity numbers in tour k+1 to which it is feasible to transfer from activity i in tour k},

it follows that,

$$M_i = \sum_{j\epsilon S_i} m_j \text{ , for } i=1,\ldots,11$$

Base transition probabilities were computed utilizing equations (1), (2) and (3).

For example, when transiting from tour number 4 (k=4), personnel in education and training billets (activity i = 1) can continue into activities 1, 2, 3, 4 or 11 for their tour number 5. Note: it is assumed that there is no attrition from education and training billets, since graduates incur additional obligated service. Therefore,

$$S_1 = \{1,2,3,4,11\} ,$$

and from equation (3), and the "adjusted movers" of Table 3.7,

$$M_1 = m_1 + m_2 + m_3 + m_4 + m_{11}$$

$$= 42.5 + 63.4 + 11.5 + 76.5 + 23$$

= 216.9 total feasible billets in tour number 5.

Therefore, for activity number 1, the base transition probabilities are computed from equation (1) as follows:

$$P_{1j}^{(4)} = (m_j/216.9) = \begin{cases} .20 \text{ if } j = 1 \\ .29 \text{ if } j = 2 \\ .05 \text{ if } j = 3 \\ .35 \text{ if } j = 4 \\ .11 \text{ if } j = 11 \\ 0 \quad \text{otherwise} \end{cases}$$

As a second example, one which includes attrition, tour number 4 personnel transiting from "1300" billets (activity i = 4) may continue to education/training, discrete sea, discrete shore, "1300" billets, "1050" billets (for aviators), "1000" billets (for aviators), or attrite (j = 1,2,3,4,7,10,12). Therefore,

$$S_4 = \{1,2,3,4,7,10,12\}.$$

Since the number of attrites are:

$m_{12} = (273 - 230.1) = 42.9$, and,

$M_4 = m_1 + m_2 + m_3 + m_4 + m_7 + m_{10} + m_{12}$

$= 42.5 + 63.4 + 11.5 + 76.5 + 1.9 + 5 + 42.9 = 243.7.$

Therefore,

$$P_{4j}^{(4)} = (m_j/243.7) = \begin{cases} .17 \text{ if } j = 1 \\ .26 \text{ if } j = 2 \\ .05 \text{ if } j = 3 \\ .31 \text{ if } j = 4 \\ .01 \text{ if } j = 7 \\ .02 \text{ if } j = 10 \\ .18 \text{ if } j = 12 \\ 0 \quad \text{otherwise} \end{cases}$$

It must be remembered, that the steady-state assumption is a *simple*, effective guideline by which to develop the initial values of the probabilities of transition. With these initial values, experience, logic, and some known values are also utilized to refine the base probability values. The resulting transition probability matrices are presented in Appendix B.

6. Assumptions and Scope

In addition to those outlined above, the following assumptions pertain to this application of FORECASTER:

- continuation rates are constant over the forecasted time-frame, or change little and slowly enough so that reasonably accurate future predictions can be based on current rates.

- tour lengths are fixed throughout the forecasted time period.

- time between tours is assumed to be zero. A tour starts immediately upon the completion of the previous tour. In reality there may be leave, travel, and temporary duty under instruction enroute to the ultimate duty station. In constructing tour lengths, estimates were always "rounded up" to allow for this additional transit time.

The scope of this application of FORECASTER is limited to the three major warfare communities. As previously discussed, the model ignores the Special Warfare (113X) and Special Operations (114X) communities. Similarly, TAR officers (Training and Administering Reserves) are excluded. Only in the surface community do TAR's fill community-specific billets, and their numbers are not significant.

The model also ignores the fact that a small number of personnel from other communities often fill either generalist billets or warfare-discrete billets. For example, in late 1989, the following situations existed:

- of approximately 6400 "1000" billets, 18 were filled by warfare specialists/trainees not included in FORECASTER's defined activities; 75 were filled by non-URL officers.

- of approximately 980 "1050" billets, 10 were filled by warfare specialists/trainees not included in defined activities; 49 were filled by General Unrestricted Line officers ("110X" designator).

IV. RESULTS AND ANALYSIS

A. OVERVIEW

Often, a major objective of manpower planning is to achieve a stationary, or steady state in which the principle variables have acceptable and relatively stable values. Such an analysis logically leads to the study of "control". Bartholomew and Forbes [Ref. 1] define control as the process of "how to choose values for those variables...which are under the manager's control" so as to achieve desired effects. The objective of control is, therefore, to "devise strategies for ensuring that change takes place in the desired direction". [Ref. 1]

Forecasting is the first step towards a study of control. Forecasting demonstrates likely outcomes under various options, enabling the analyst to choose between these options in light of their consequences. It is a process of trial and error; control starts with a goal, and works backwards to determine strategies which lead to that goal.

First, the results of the "status-quo", or current, distribution of warfare specialists among generalist billets are analyzed. Different policies concerning tour lengths and transition probabilities will then be analyzed to see the effects of changes in tour lengths and alternative distributions on a community's ability to fill a "fair-share" of generalist billets.

Forecasts were conducted in intervals of two quarters, from the initial ($t = 0$) distribution of incumbents out to 20 quarters. Two quarters were utilized to present a fairly smooth graph from which to identify trends. A maximum of 20 quarters were used to forecast due to the general decline in accuracy as forecasts are projected too far into the future.

Forecasted results are the distribution of the number of personnel available at some future time. They are presented in x-y plots of number of personnel versus quarters forecasted for each tour number of a given activity. It is emphasized that the significance of these graphs lies more in the trends displayed rather than in the actual numbers.

A horizontal line implies a steady state has been reached at that particular activity/tour. Any other than horizontal line implies a departure from steady-state. An increasing trend would result from more personnel entering a particular activity/tour cell than are leaving. Similarly, a decreasing trend implies fewer personnel are entering than leaving, indicating an inability of the given activity to maintain its initial values for that particular tour. The slope of the line is an indication of the magnitude of these trends and can be compared to other lines (on the same graph) in a relative sense.

A lack of trend, or an erratic, inconsistent line implies significant departure from steady-state. Any line which deviates significantly from the initial distribution, may imply a situation that would require manual intervention on the part of manpower planners to return the system to steady-state.

As presented earlier, FORECASTER assumes that the "experience level" of all officers within each billet cell (for a particular tour number) is initially evenly distributed. Upon completion of a model run, the forecasted distribution is presented in the aggregate regardless of the distribution of experience level. For consecutive iterations of a forecasted scenario, should the user decide to replace the incumbents with this forecasted distribution and then continue the forecasting with these new incumbents, an inaccuracy would be introduced. Therefore, replacing the incumbents with the forecasted distribution is not the preferred method of forecasting for the long run. Rather, for successive interval data points throughout a forecasted timeframe, the expected distributions are generated by successive model runs, each initialized at time zero with identical data and parameter values.

The following analyses focus on the allocation of personnel among generalist billets. With respect to the required fill of discrete billets among warfare communities, the assumption is made that these priority billets are able to be filled prior to the distribution of personnel among the generalist billets. In actuality, the system does have enough slack and flexibility to substitute personnel among adjacent ranks. In view of the model structure which consists of tours spanning several ranks, this assumption is further justified.

B. THE "STATUS-QUO" (CURRENT) DISTRIBUTION

Analysis of the "status-quo" utilizes the parameter values presented in Chapter III and the base transition probabilities given in Appendix B. Under this scenario, the effects of all current parameter values are analyzed.

Figure 4.1 is a display of the model results for Surface Warfare specialists filling 1050 billets (activity 5). In tours number two through six, it is seen that the surface community cannot continue to support its current share of 1050 billets. These tours show a steady decline out to quarter eight, remaining far below the "status-quo" distribution throughout the 20 quarters forecasted. Tours two and three begin to recover at quarters ten and twelve, respectively, but remain well below the initial distribution and their recovery falls far short of initial values.

Figure 4.1 also shows that in the later tours of activity 5, the surface community is better able to fulfill its initial distribution. Tours seven, ten, and eleven remain relatively flat and quite close to their initial values. Tours eight and nine are able to maintain their initial levels somewhat over the early quarters forecasted, but then show a general decline

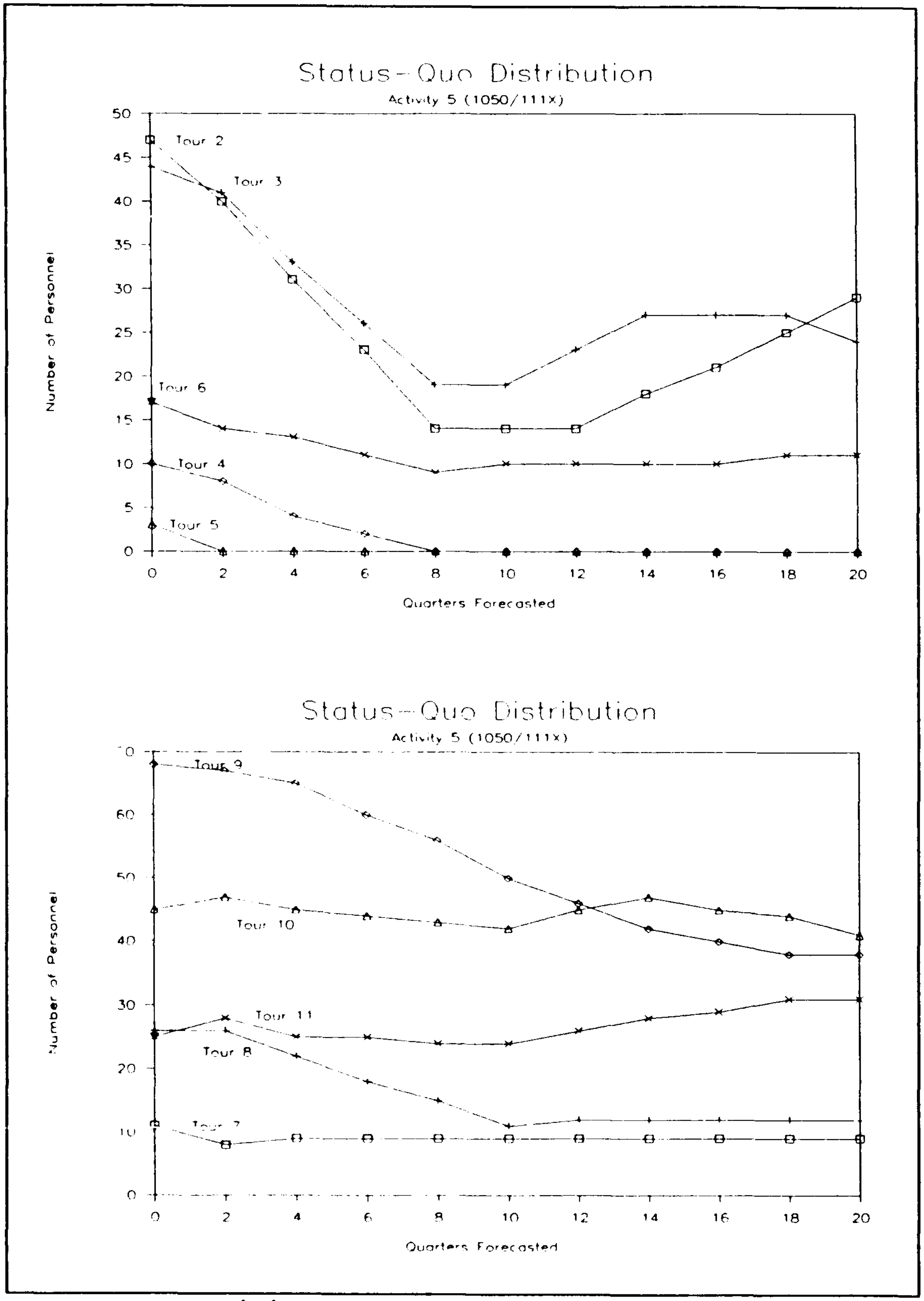


FIGURE 4.1: Activity 5, Surface Community/1050 Billets Status-Quo Scenario

of their ability to fulfill initial values beyond four quarters into the future.

The submarine community results with respect to 1050 billets are shown in Figure 4.2. Only tours two, three, and eight are shown since all other tours go to zero at two quarters forecasted. Although tours three and eight are able to meet requirements out to two quarters, it is seen that the submarine community has an acute problem with being able to meet its current distribution of 1050 billets any significant amount of time into the future.

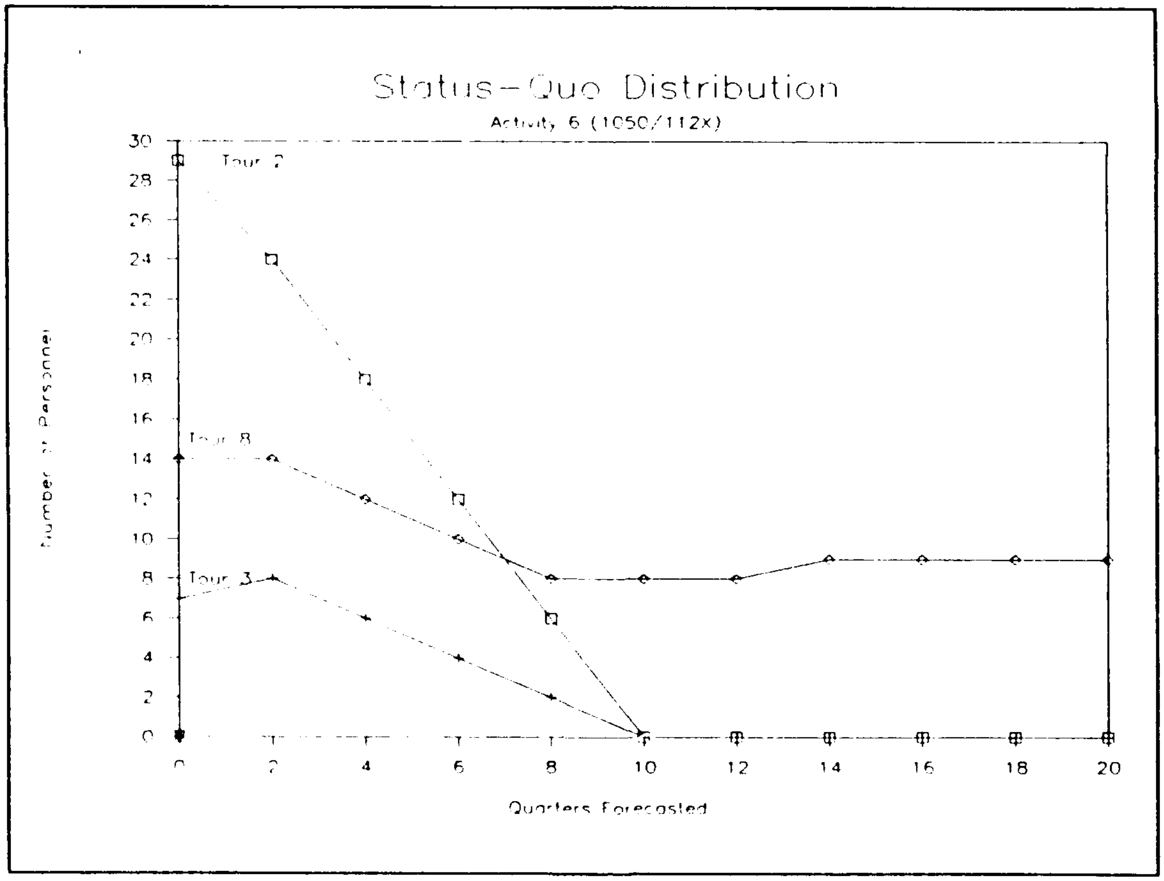


FIGURE 4.2. Activity 6, Submarine Community/1050 Billets Status-Quo Scenario

Figure 4.3 presents the "status-quo" results for the aviation community. With the exception of tours two and three, and to a lesser degree, tours six and eight, the aviation community has little or no problem fulfilling its current 1050 billet distribution.

C. ALTERNATIVE POLICIES AND DISTRIBUTIONS

1. The Effects of Tour Lengths

In order to maintain combat readiness, Navy manpower managers are constantly striving to get the best-qualified officers into operational billets. A problem they continually face is how to give every qualified officer the opportunity to serve in a professionally rewarding operational tour. There are generally not enough operational units available to meet the demand. For example, the satisfactory performance of a surface-qualified Lieutenant Commander as Department Head of a ship demonstrates that the officer is qualified to be Executive Officer afloat. However, the relatively small number of Executive Office billets available may prevent that individual from being selected for the actual billet at that particular time. Congress governs the number of ships, submarines, and aircraft which directly determines the total authorized billets available.

By adjusting tour lengths Navy manpower planners can more readily meet the dynamics of personnel inventory resulting from distributional anomalies within year groups. Tour lengths must be long enough to fulfill training

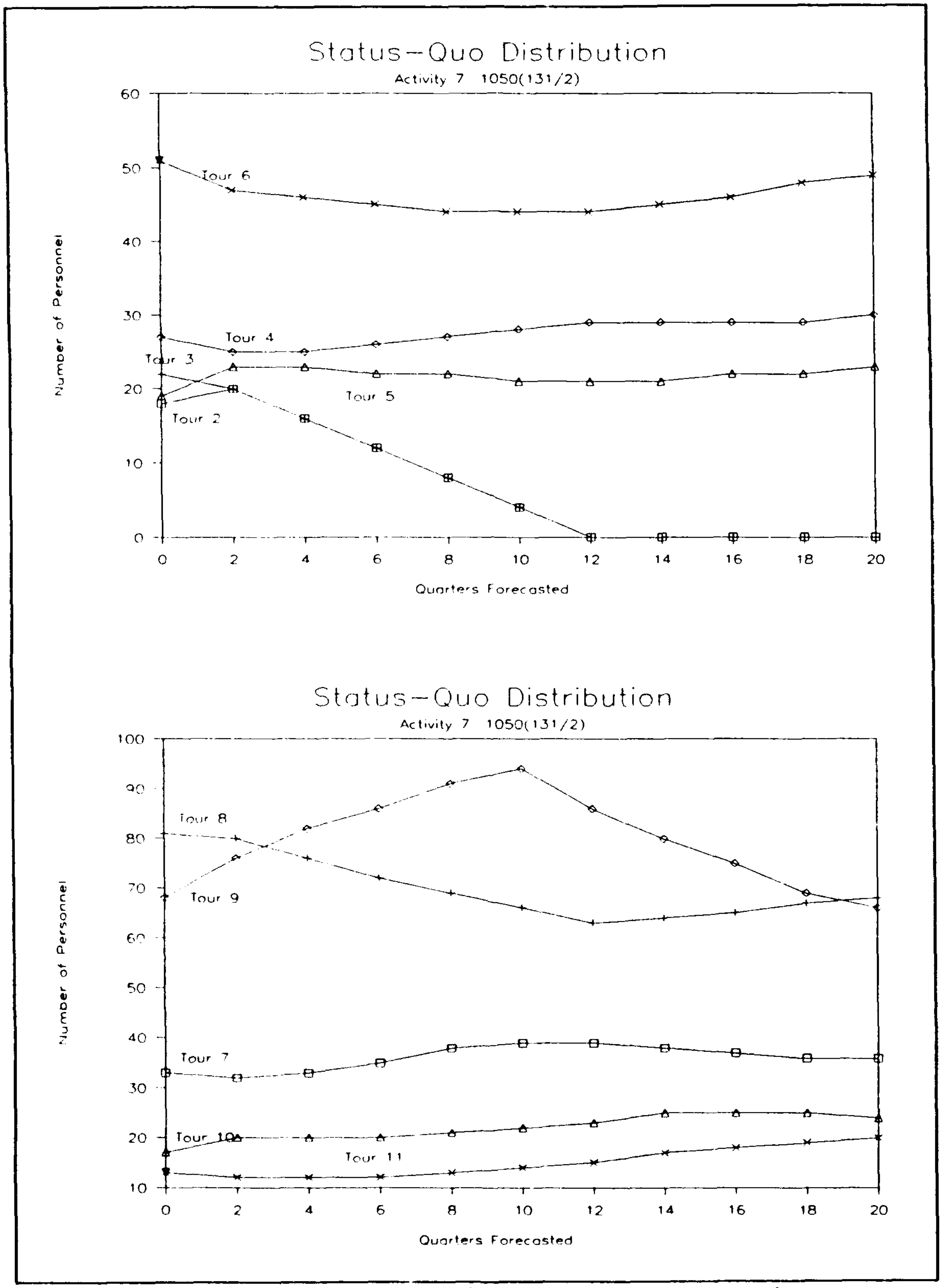


FIGURE 4.3. Activity 7, Aviation Community/1050 Billets
Status-Quo Scenario

requirements and contribute to readiness, but be short enough to maintain a personnel rotation which provides operational expertise ashore and the necessary quality-of-life to retain qualified individuals.

The effects of tour lengths were subjectively applied to FORECASTER under two separate viewpoints: the "Warfare Point of View", in which the priority of personal, professional development and combat readiness are equated to an initially longer discrete billet tour length (post-training), and an equal tour length of eight (8) quarters throughout discrete and generalist billets; and the "Generalist Point of View", in which the generalist billets are filled in two and one half year tour lengths to better utilize the warfare experience and expertise of warfare specialist. The resulting tour lengths matrices are displaced in Tables 4.1 and 4.2, respectively.

a. Warfare Point of View

FORECASTER was next run utilizing the tour lengths of Table 4.1. Figure 4.4 clearly shows that this more consistent, even distribution of tour lengths has minimal impact in the short term of early surface warfare specialist tours. In the later tours, the short term impact is actually a lesser ability to fulfill generalist billet requirements. Under the "status-quo" scenario of Figure 4.1, the later tours of surface warfare specialists were fairly stable over the first four quarters. As expected, further comparison of

TABLE 4.1 CURRENT TOUR LENGTHS

ACTIVITES	1	2	3	4	5	6	7	8	9	10	11
ED/TRNG		9	8	8	8	6	4	4	4	4	4
DISCRT SEA	12	10	8	8	8	8	8	8	8	7	7
DISCRT SHR		8	8	8	8	8	8	8	8	8	8
1300 BILLET		8	8	8	8	8	8	8	8	8	8
1050 (111X)		8	8	8	8	8	8	8	8	8	8
1050 (112X)		8	8	8	8	8	8	8	8	8	8
1050 (131/2)		8	8	8	8	8	8	8	8	8	8
1000 (111/6)		8	8	8	8	8	8	8	8	8	8
1000 (112/7)		8	8	8	8	8	8	8	8	8	8
1000 (13XX)		8	8	8	8	8	8	8	8	8	8
1000 (1100)	8	10	10	10	10	10	10	10	10	10	10

TABLE 4.2 CURRENT TOUR LENGTHS

ACTIVITES	1	2	3	4	5	6	7	8	9	10	11
ED/TRNG		9	8	8	8	6	4	4	4	4	4
DISCRT SEA	12	10	10	8	8	8	8	8	8	7	7
DISCRT SHR	10	10	10	10	10	10	10	10	10	10	10
1300 BILLET	10	10	10	10	10	10	10	10	10	10	10
1050 (111X)	10	10	10	10	10	10	10	10	10	10	10
1050 (112X)	10	10	10	10	10	10	10	10	10	10	10
1050 (131/2)	10	10	10	10	10	10	10	10	10	10	10
1000 (111/6)	10	10	10	10	10	10	10	10	10	10	10
1000 (112/7)	10	10	10	10	10	10	10	10	10	10	10
1000 (13XX)	10	10	10	10	10	10	10	10	10	10	10
1000 (1100)	10	10	10	10	10	10	10	10	10	10	10

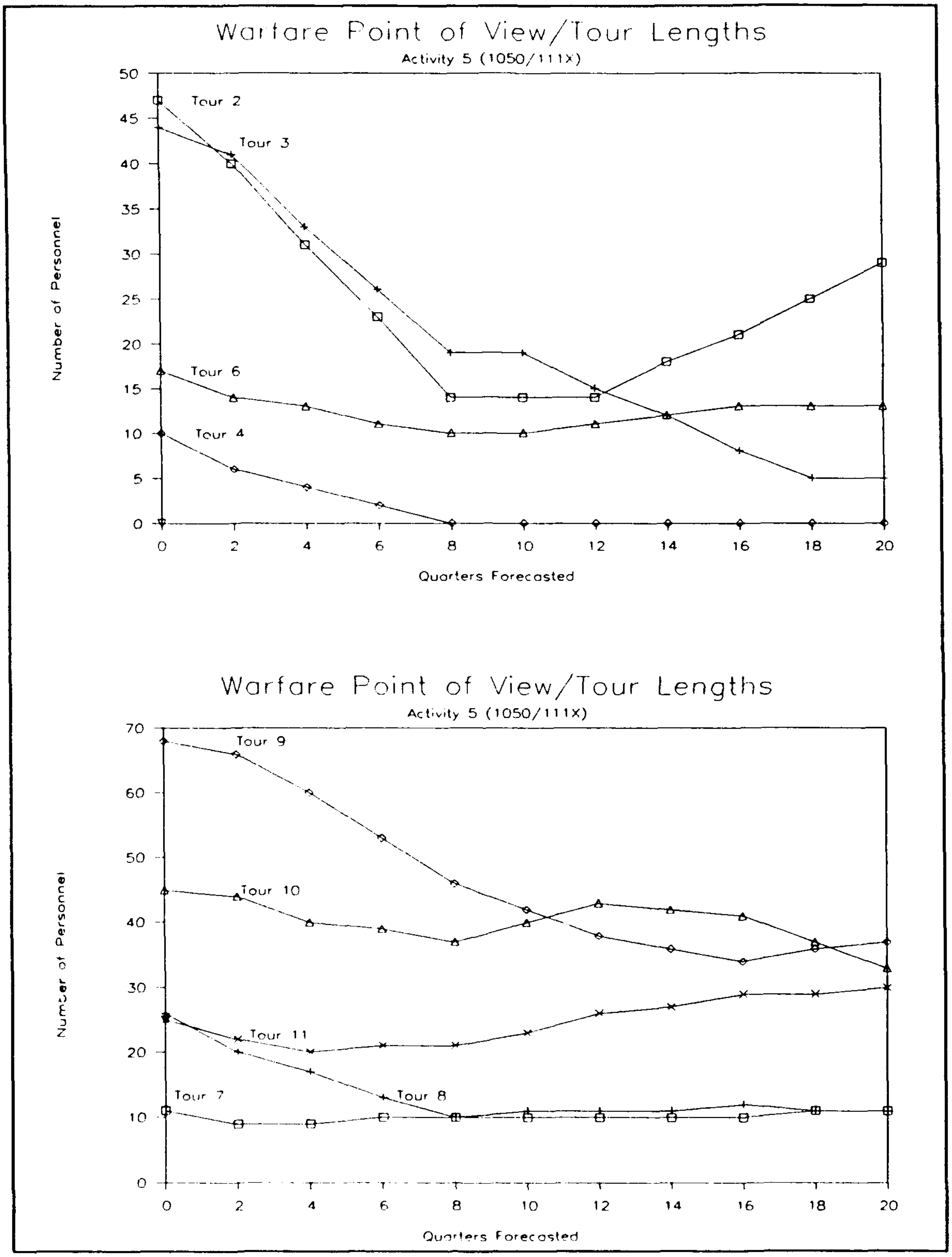


Figure 4.4 Activity 5, Surface Community/1050 billets Warfare Point of View/Tour Lengths

Figures 4.1 and 4.4 shows a generally lesser ability under the tour lengths of Table 4.1 of the surface community to fulfill their required generalist billets into the later quarters.

Figure 4.5 displays the submarine community's inability to fill generalist billets under the warfare point of view tour lengths of Table 4.1. Note that the general trends are very similar to the status-quo scenario of Figure 4.2. Also note that under the status-quo scenario, tours 2 and 3 are driven to zero at quarter ten (10); under the warfare point of view, at quarter eight (8). As in the comparison o the surface community, FORECASTER clearly demonstrates the submarine community's lesser ability to fulfill generalist billet requirements under a warfare point of view of tour lengths.

Figure 4.6 graphically displays that the aviation community shows a dramatic reduction in its ability to fulfill generalist billet requirements under tour lengths of the warfare point of view. In virtually every tour, there is not only a lesser ability to meet requirements, but a comparison of Figures 4.3 and 4.6 illustrates a greater departure from the near steady-state of the status-quo scenario.

b. Generalist Point of View

Utilizing the tour lengths of Table 4.2, FORECASTER was run to demonstrate the effects of a consistent two and a half year tour length among generalist billets.

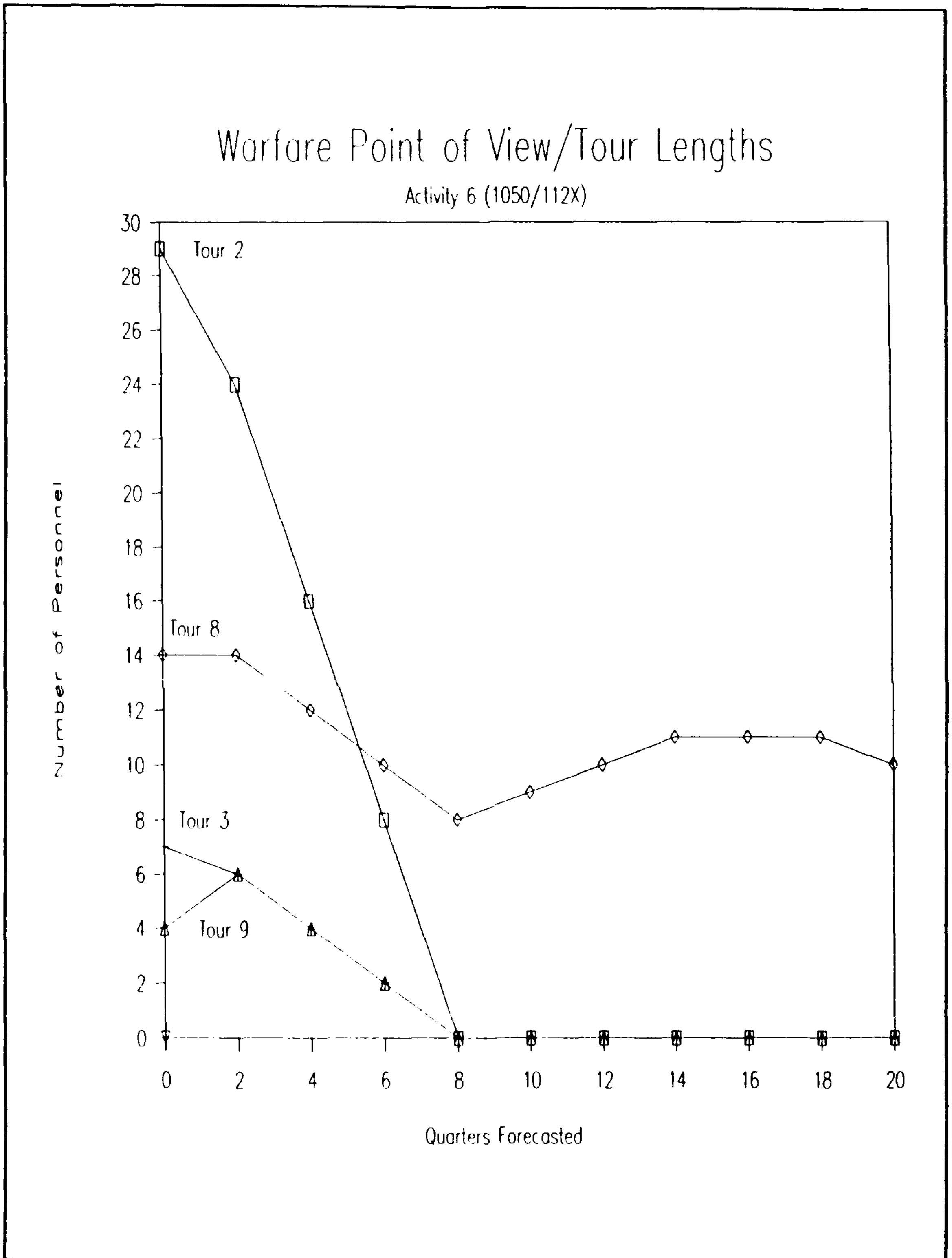
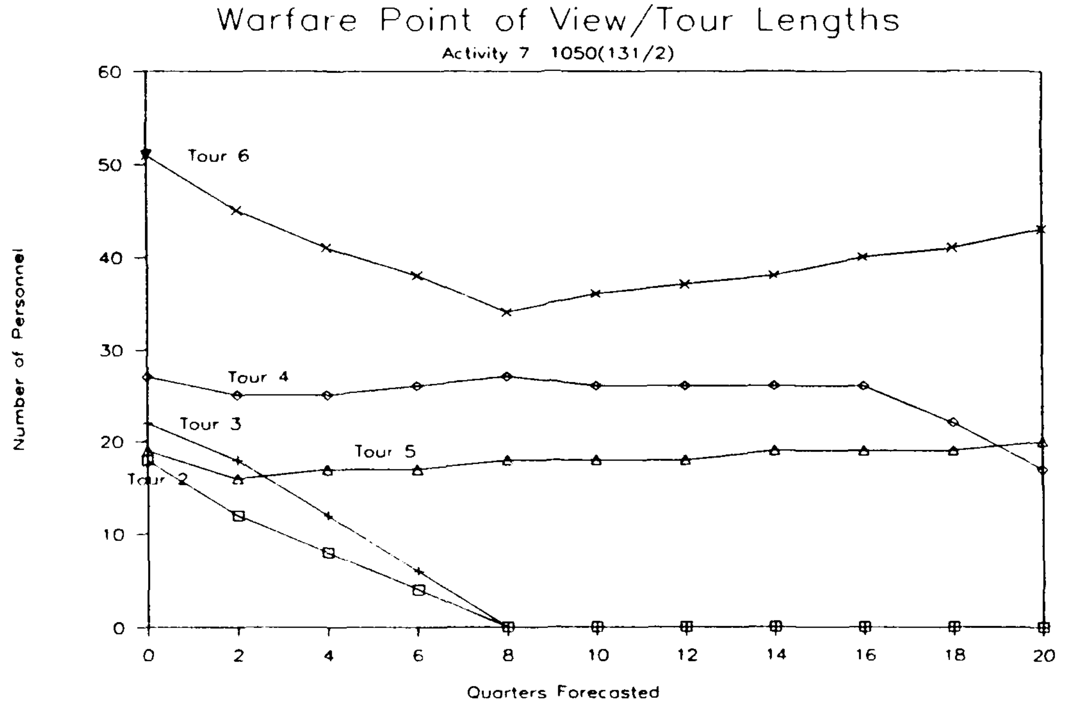


Figure 4.5 Activity 6, Submarine Community/1050 billets Warfare Point of View/Tour Lengths



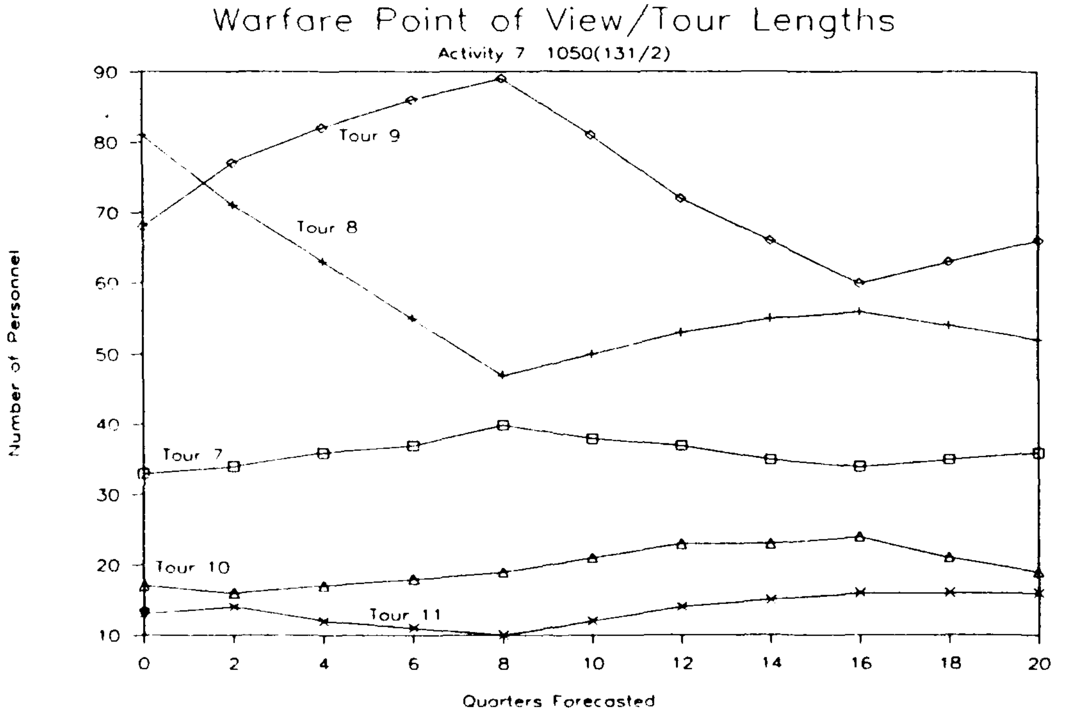


Figure 4.6 Activity 7, Aviation Community/1050 billets Warfare Point of View/Tour Lengths

In comparison with the "status-quo" of Figure 4.1, the surface community is shown in Figure 4.7 to have slightly greater ability to fulfill generalist billet requirements in the near-term forecast of earlier tours; later tours shows little, if any, significant difference. In comparison with the warfare point-of-view of Figure 4.4, Figure 4.7 displays a generally greater ability to fulfill generalist requirements under this consistently longer tour length scheme; this is as expected.

Within the submarine community, Figure 4.8 shows that in the early tours (2 and 3), the distribution of billet fill in the generalist view is consistent with that of the "status-quo" tour lengths. Tour 8, although unable to maintain its numbers over the first two quarters, soon reaches a steady-state and is much more able to fulfill billet requirements in the alter quarters (compare Figures 4.2, 4.5 and 4.8).

The generalist tour lengths applied to the aviation community, Figure 4.9, display a better ability to fulfill requirements than the warfare point of view of Figure 4.6. Numbers are available further into the future and departures from the steady-state are less dramatic. Comparing Figures 4.3 and 4.9, FORECASTER clearly demonstrates that the aviation community is little effected by a generalist view of tour lengths.

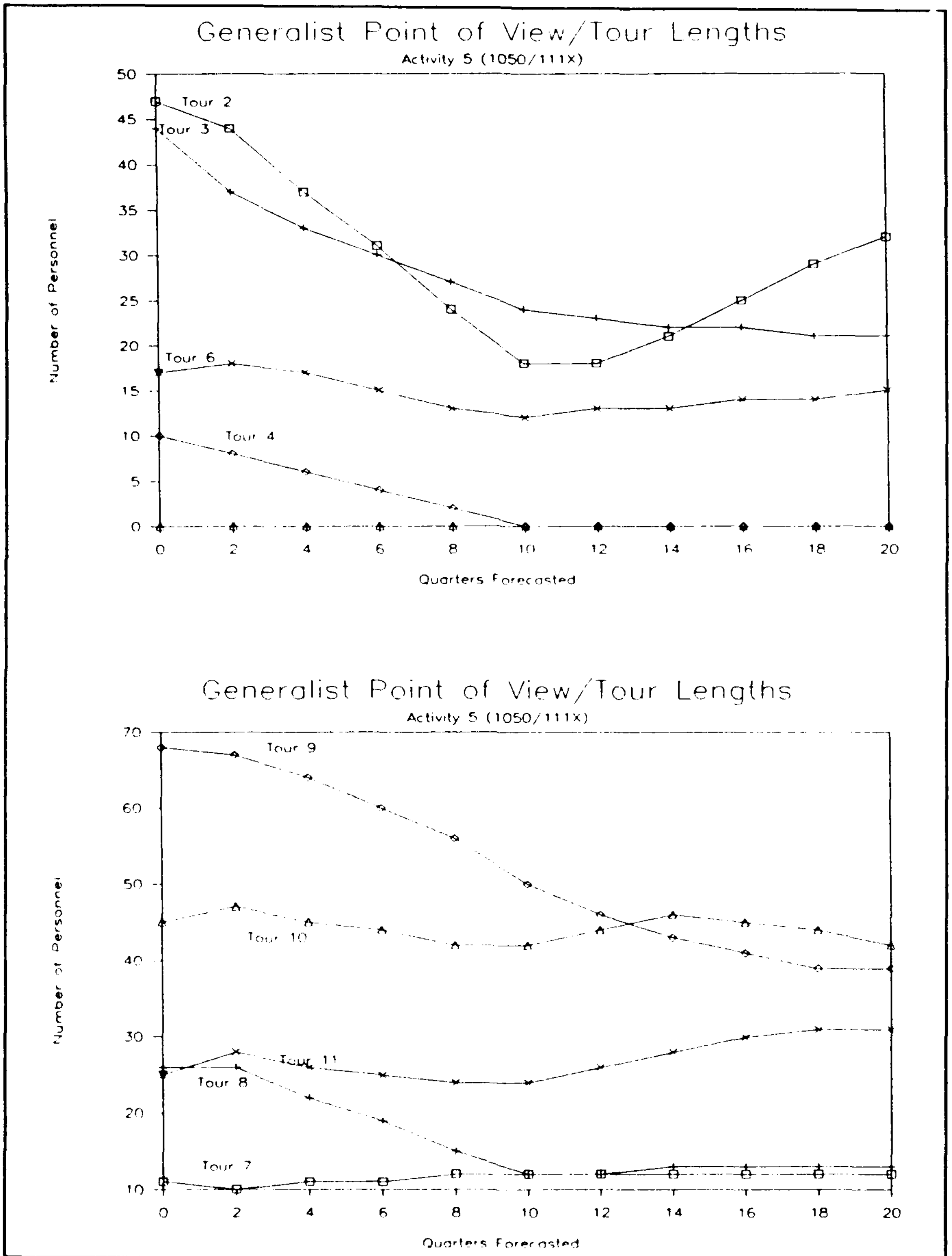


Figure 4.7 Activity 5, Surface Community/1050 billets Generalist Point of View/Tour Lengths

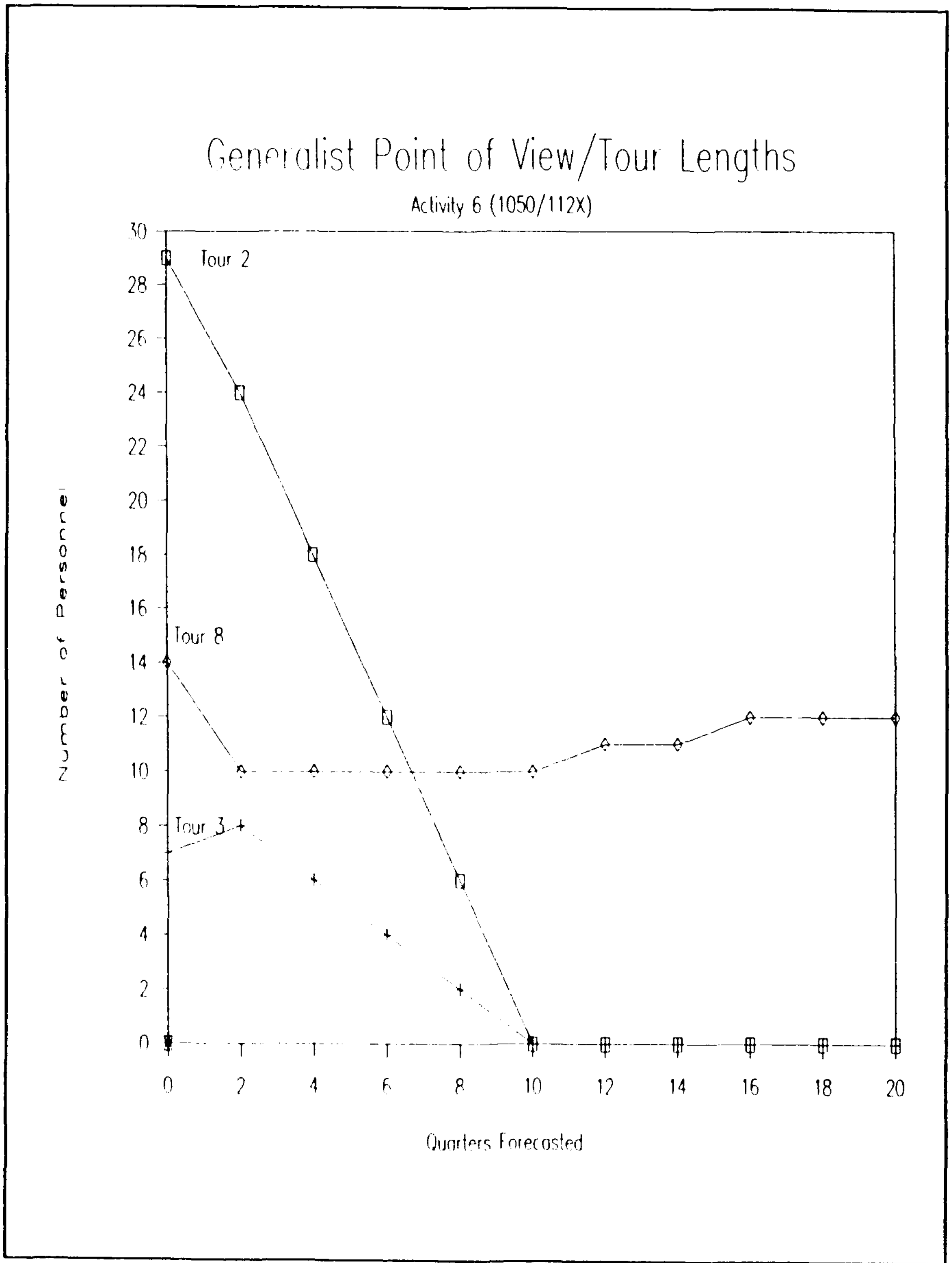


Figure 4.8 Activity 6, Submarine Community/1050 billets Generalist Point of View/Tour Lengths

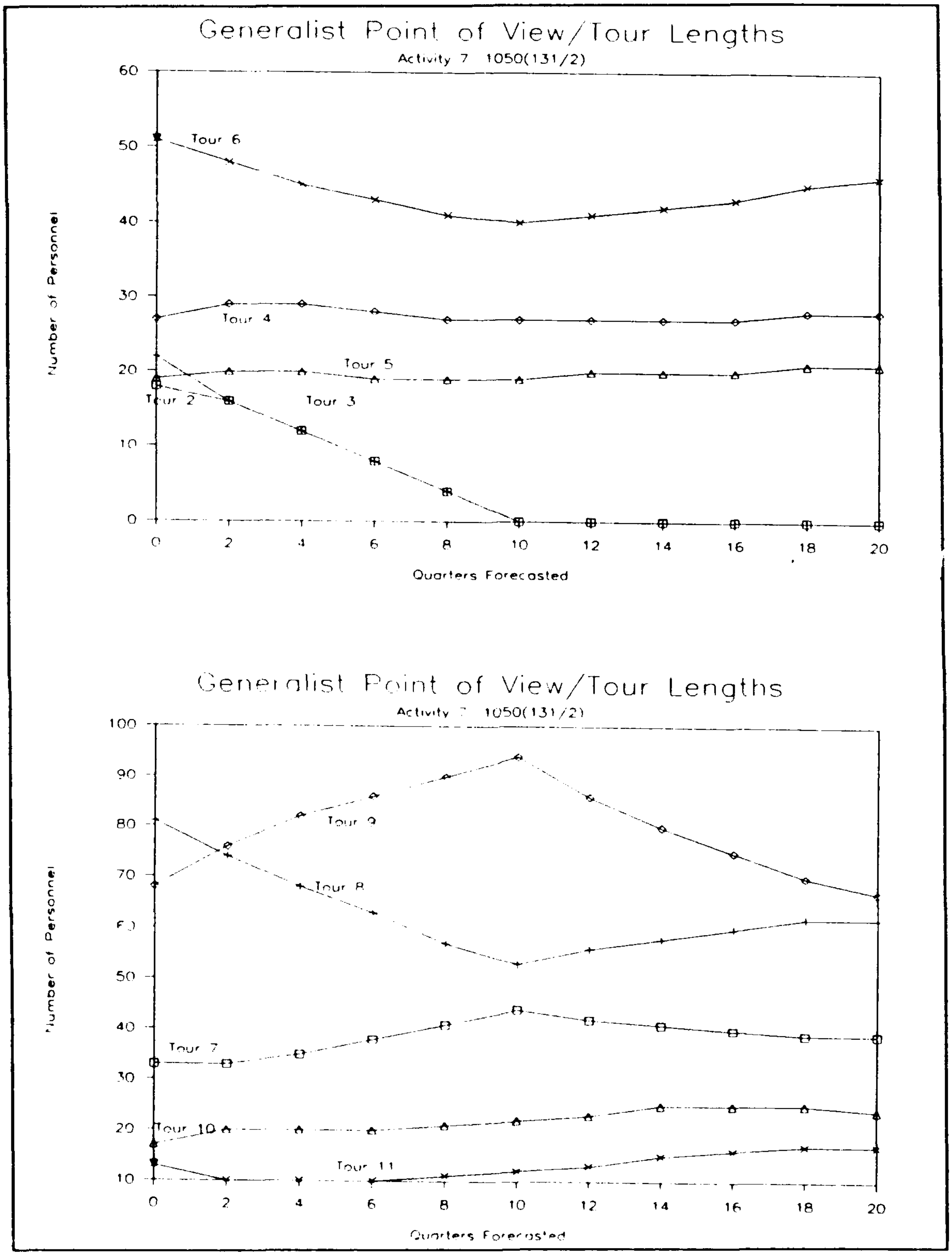


Figure 4.9 Activity 7, Aviation Community/1050 billets Generalist Point of View/Tour Lengths

2. Alternative Guidance Pertaining to Transition Probabilities

Recall from Chapter III, paragraph C-5, that base transition probabilities were originally developed under a steady-state assumption in conjunction with subjective applications of experience, logic, and some known values. In any model of a "real world" situation such subjectivity is inevitable. As the complexity of the system being modeled increases, the modeler will be drawn increasingly further from a single input into an ideal series of equations which provides an accurate output. The modeler's challenge is therefore to subjectively apply the total known and perceived parameters in order to best simulate the real world.

To further demonstrate the flexibility of FORECASTER, the model was run utilizing the initial tour lengths and parameters of the status-quo" scenario with the alternate transition probabilities of Appendix C. These alternate probability matrices were subjectively developed with a "warfare point of view" toward transitioning from one tour to the next. Maintaining some semblance of a realistic transition probability into generalist billets, the alternate transition probability matrices of Appendix C are weighted toward keeping the majority of warfare specialists in operational/warfare-related billets. For consistency, attrition rates were kept equal to those of Appendix B.

A comparison of Figures 4.1 and 4.10 shows that these alternate transition probabilities have little effect on the

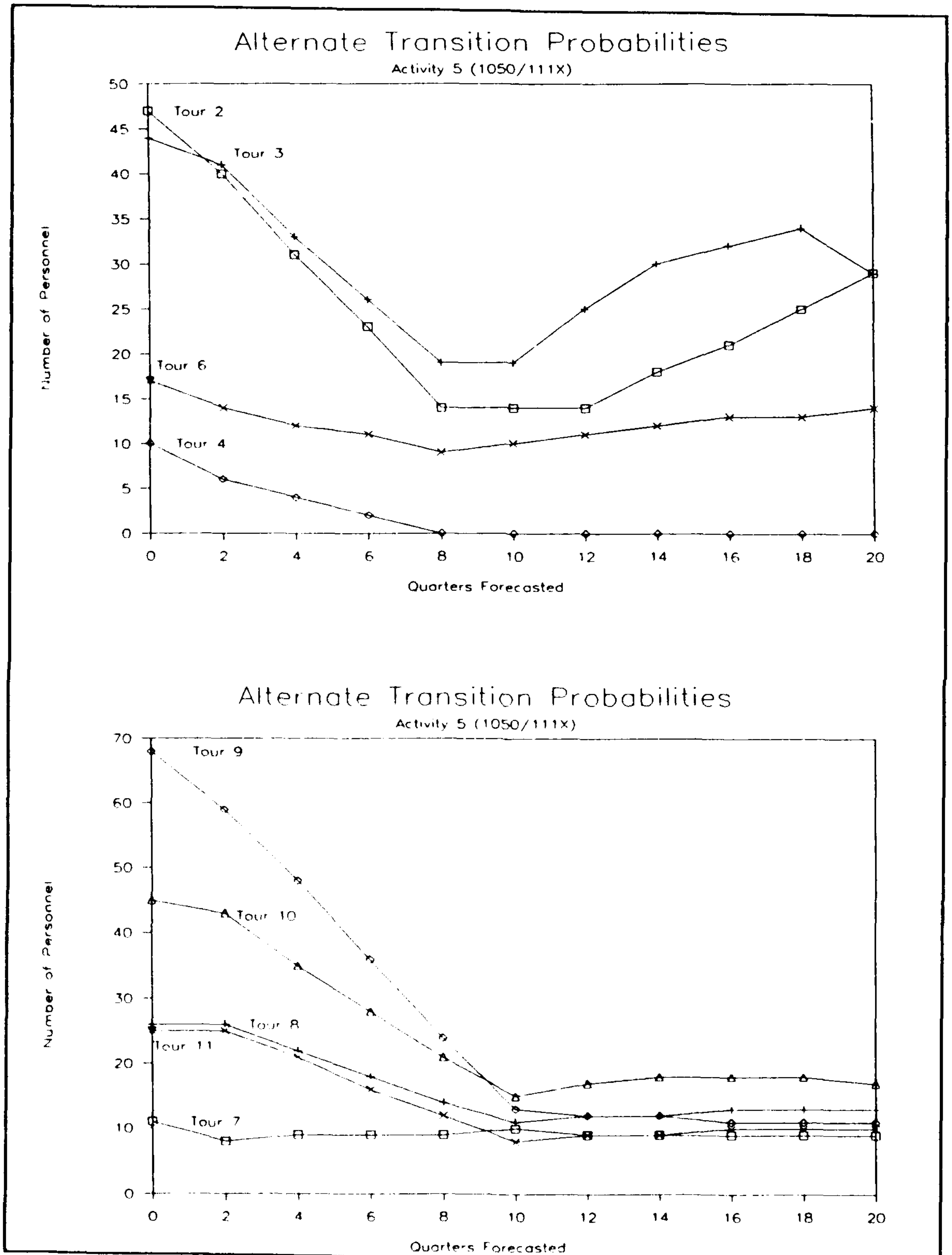
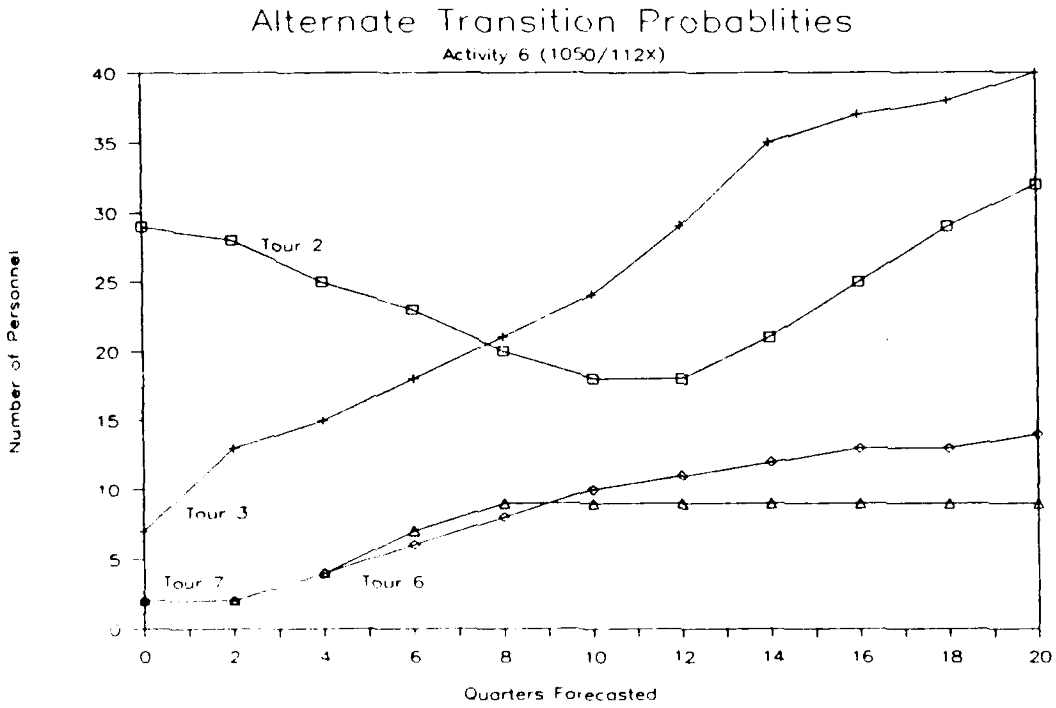


Figure 4.10 Activity 5, Surface Community/1050 billets Alternate Transition Probabilities

earlier tours of the surface warfare community. In the later tours, transition probabilities have a significant effect on hindering senior surface-qualified officers in filling generalist billets. This is as expected, since the majority of warfare specialist billets are in the mid to later years in a career and this would be reflected in the higher tour numbers of the model. A similar relationship is seen in the aviation community, comparing Figures 4.3 and 4.12.

In analyzing the submarine community in Figures 4.2 and 4.11, this same relationship is not observed. In fact, quite a different effect is realized. Under the alternate transition probabilities of Appendix C, the submarine community is much more capable of meeting generalist billet requirements throughout the range of tours. Given their extremely limited ability to fill generalist billets in the status-quo scenario, Figure 4.11 effectively validates the model by demonstrating that even with its restrictive initial parameters realistic transition probabilities are possible from which the submarine community could fulfill its generalist billet requirements throughout various tours. Recalling that these alternate transition probabilities of Appendix C were subjectively developed maintaining some semblance of a realistic transition into generalist billets, FORECASTER thereby confirms the status-quo distribution of the submarine community which generally places a low priority on its generalist billet requirements.



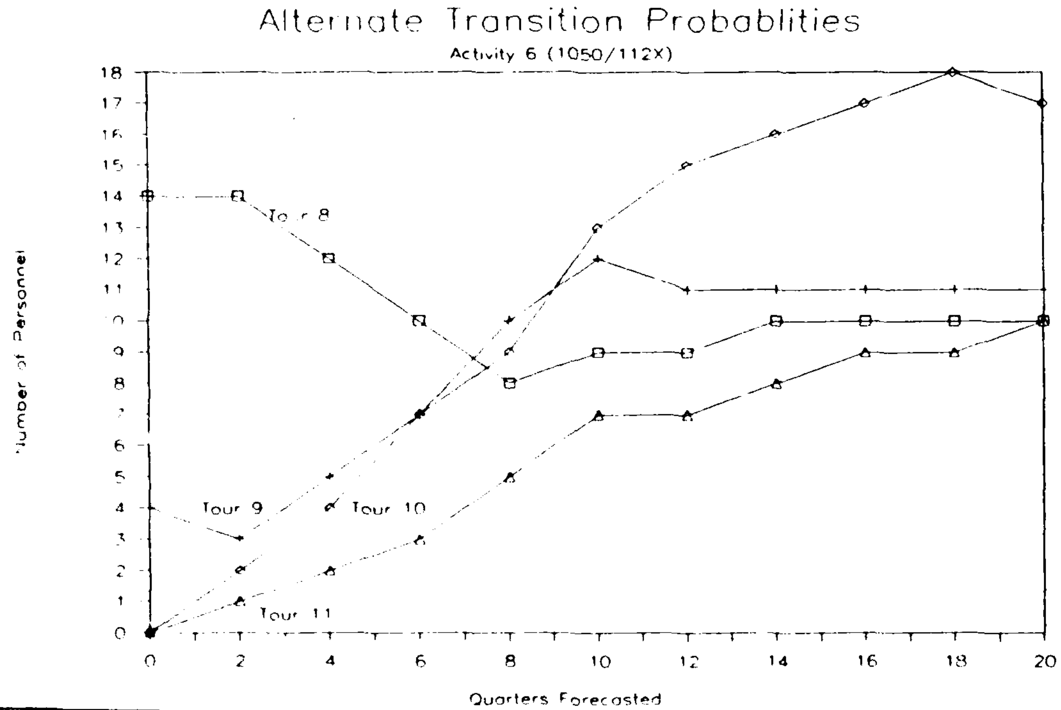


Figure 4.11 Activity 6, Submarine Community/1050 billets Alternate Transition Probabilities

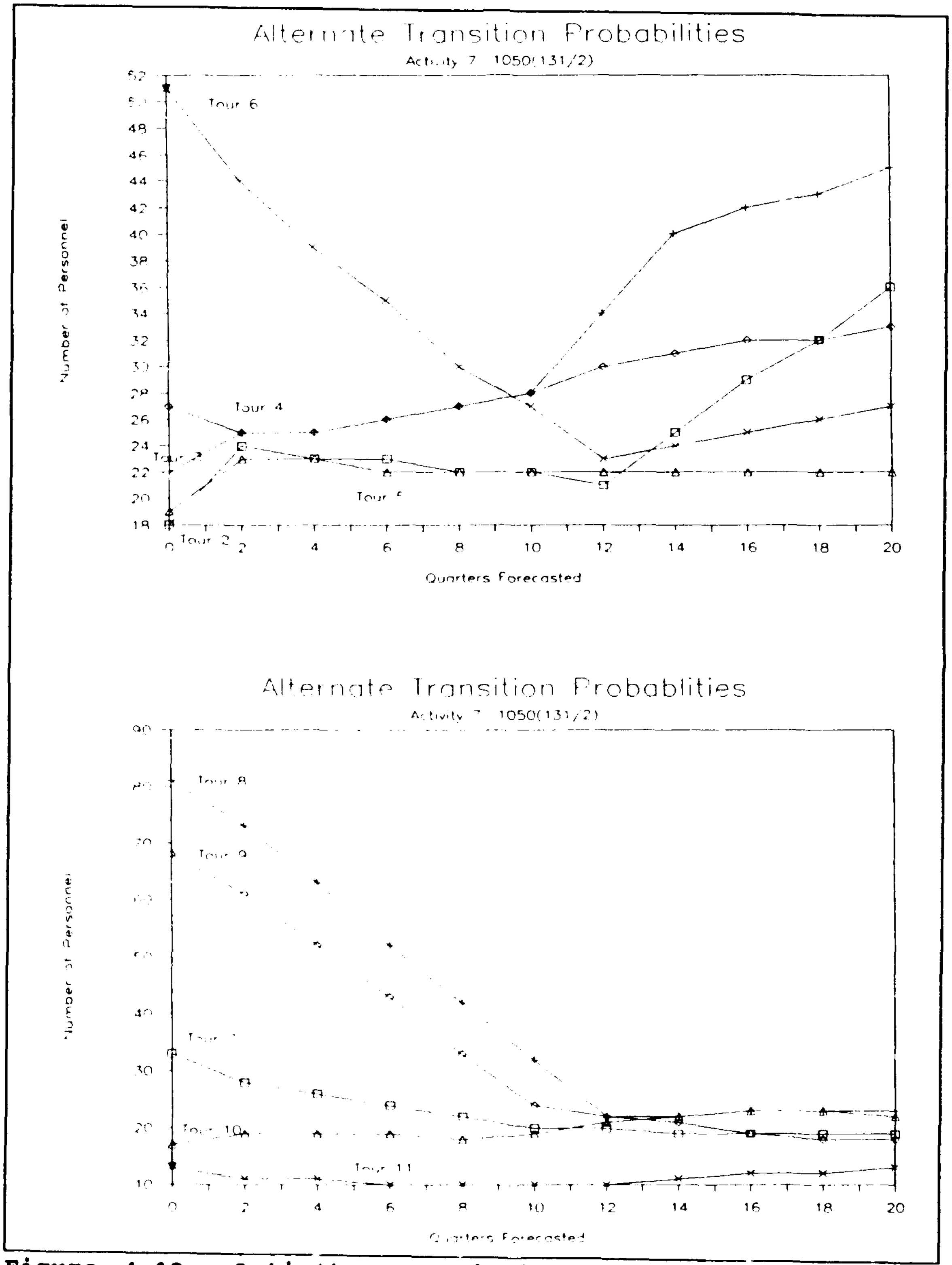


Figure 4.12 Activity 7, Aviation Community/1050 billets Alternate Transition Probabilities

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

FORECASTER has illustrated the capabilities of each of the primary warfare communities in filling their generalist billet requirements. In each of the scenarios presented, the aviation community had very little problem in meeting requirements. Even under the generalist point-of-view of tour lengths, there was little effect on the distribution of aviators among generalist billets. At the other extreme were the submariners, who under all scenarios had an acute problem in meeting a fair share of generalist billet requirements any time in the future and throughout all tours.

The effects of changing scenarios were best illustrated in the analysis of the surface warfare community. Under the warfare point-of-view, although there was minimal impact in the short term of early tours, there was overall a lesser ability in the later years to fulfill generalist requirements, as expected. Under the generalist point-of-view, there was a significant increase in the ability to fill requirements in the near-term of earlier tours, and generally an increased abililty to fill requirements throughout all tours and years.

With relatively significant changes in tour lengths, FORECASTER generally displayed little overall change in the distribution of warfare specialists among generalist billets.

This fact, in itself, illustrates the drastic changes required to achieve the illusive steady-state. In the "real world", this fact is reflected in the manual intervention required by personnel detailers and community managers who must constantly adjust tour lengths in order to keep some semblance of order in the distribution system.

FORECASTER has demonstrated itself to be a reasonable reflection of the real world as illustrated by the status-quo distribution. Applying different points of view in adjusting tour lengths and transition probabilities resulted in logical results in each communities' ability to fulfill generalist billet requirements.

B. CONCLUSIONS

FORECASTER has been demonstrated to be an effective tool in analyzing multiple communities and their distributive properties throughout a specific billet structure. Its flexibility and sensitivity in analyzing specific properties within and among different communities has been graphically illustrated.

FORECASTER is a fast, flexible, and sensitive tool through which community managers can effectively evaluate differing alternatives, analyze the impact of future requirements, and test the radical changes which may be required to meet the realities of the Navy's future personnel distribution process.

C. RECOMMENDATIONS

The most difficult aspect in the utilization of FORECASTER is the development of the matrices of the initial distributional parameters. This process inevitably involves subjectivity. Clearly, more work is required in this area to refine these initial parameters and reduce the subjectivity involved.

Historically, community managers have focussed their adjustments in the personnel distribution process on changes in tour length. As the Navy grows smaller, their focus must inevitably include the transition probabilities in consonance with adjustments to tour length. Given a reasonable set of parameters, FORECASTER is a fast, flexible, and sensitive model through which such adjustments can be analyzed and alternatives considered.

Perhaps a more practical, but highly elaborate way to use FORECASTER would be to forecast one quarter at a time, changing the transition probability matrices at each step. This procedure would simulate, to a large extent, what community managers and detailers do in their day-to-day work. Such a method of forecasting, however, would require more detailed data from personnel managers.

APPENDIX A

NAVY STUDY GROUP TOUR LENGTHS

TABLE A-1 SURFACE COMMUNITY (110X/116X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SEA TOUR DIV. OFF. AFLOAT	2.5
DIV. OFF. FOLLOW ON TOUR	2.0
1ST SHORE TOUR: STAFF/REC/NPS	2.0
NONSCREEN SHORE	2.0
DEPT. HEAD COURSE SWO SCH	1.0
FIRST DEPT. HEAD TOUR	1.5
2ND DEPT HEAD TOUR SHIP	1.5
2ND SHORE (A)	3.0
2ND SHORE: NPGS/SHR STF/PG UT.	2.0
SHORE TOUR (B)	2.0
JR SVC COLLEGE (A)	1.0
JOINT TOUR (A)	3.0
LCDR XO TOUR	1.5
PXO TRAINING	0.5
PXO (2)	0.5
LCDR XO (2)	1.5
3RD SHORE TOUR	3.0
4TH SHORE TOUR	3.0
JR SVC COLLEGE (B)	1.0
JOINT TOUR (B)	3.0
NONSCREEN COMMANDERS	3.0
PCO COURSE	1.0
3RD SHORE (2)	3.0
CDR COMMAND	2.0
NONSCREEN COMMANDER (B)	2.0
POST JOINT TOUR	2.0
SR SVC/PME (1)	1.0
FIFTH SHORE	3.0
JOINT TOUR (1)	2.0
MAJOR COMMAND	2.0
SR SVC/JPME (2)	1.0
JOINT TOUR (2)	3.0
SEQ COMMAND	2.0
SERVICE SCHOOL INST.	3.0
SIXTH SHORE TOUR	3.0
SEVENTH SHORE TOUR	3.0

TABLE A-2 SUBMARINE COMMUNITY (112X/117X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SEA TOUR	3.0
POST JO SHORE TOUR / NPGS	2.5
LT NONSCREENER TOUR	3.5
SOAC	0.5
DEPT HEAD SPLIT (A)	2.5
DEPT. HAD TOUR	3.0
DEPT HEAD SPLIT (B)	2.0
POST DH SHORE 1	2.0
POST DEPT HEAD (2)	2.0
PXO/XO 1	2.0
PXO/XO 2	2.0
JR SVC COL	1.0
POST XO SHORE	2.0
JOINT TOUR 1	2.5
PCO 1	0.5
COMMAND 1	2.0
PCO 2	0.5
COMMAND 2	2.5
PCO 3	0.5
COMMAND 3	2.0
COMMANDER ASHORE A	2.0
SR SVC COL (A)	1.0
POST COMMAND SHORE	3.0
JOINT TOUR 2	3.0
MAJOR COMMAND (A)	2.0
MAJOR COMMAND (B)	2.0
SR SVC COL (B)	1.0
CAPT SHORE TOUR (A)	2.0
JOINT TOUR 3	2.0
CAPT SHORE (B)	2.0
JOINT TOUR 4	3.0
INSTRUCTOR TOUR	4.0
CAPT SHORE (C)	4.0

TABLE A-3 JET PILOT (1310)

CAREER PATH/TOURS	TOUR LENGTH
1ST SQUADRON TOUR	3.0
1ST SHORE TOUR	3.0
LT SEA TOUR	2.0
FRS	0.5
DEPARTMET HEAD TOUR	2.0
LCDR SHORE TOUR (A)	3.0
JR SVC COL (A)	1.0
JOINT TOUR (A)	2.0
FRS	0.5
CDR SHORE TOUR	2.0
SQUADRON XO	1.5
SQUADRON CO	1.5
NONSCREEN CDR SEA TOUR	2.5
CDR SEA TOUR	2.0
SR SVC COL (CDR)	1.0
CDR JOINT TOUR	3.0
NONSCREEN CDR SHORE TOUR	2.5
SENIOR SHORE (A)	2.0
MAJOR SEA COMM	1.5
CAPT SR SVC COL	1.0
SHORE CAPT STAFF (A)	2.0
CAG/SHIP CMD	1.5
CAPT JOINT TOUR	3.0
SEQ CMD	1.5
SHORE CAPT STAFF (B)	2.0
SR SHORE (B)	3.0
INSTRUCTOR TOUR	3.0

TABLE A-4 PROP PILOT (131X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SQUADRON TOUR	3.0
1ST SHORE TOUR	3.0
LT SEA TOUR (A)	2.0
LT SEA TOUR (B)	3.0
FRS	0.5
DEPARTMENT HEAD TOUR	2.0
JR SVC COL (A)	1.0
LCDR SHORE TOUR (A)	3.0
JOINT TOUR (A)	2.0
LCDR SHORE TOUR (B)	2.0
FRS	0.5
SQUADRON XO	1.0
SQUADRON CO	1.0
NONSCREEN CDR SEA TOUR	1.5
CDR SEA TOUR	2.0
SR SVC COL (CDR)	1.0
SEA STAFF	2.0
CDR JOINT TOUR	3.0
NONSCREEN CDR SHORE TOUR	3.0
SENIOR SHORE (A)	2.0
MAJOR SHORE COMMAND	1.5
SHORE CAPT STAFF (A)	3.0
CAPT SR SVC COL	1.0
MAJOR SEA COMM	1.5
CAPT JOINT TOUR	3.0
SEQ. CMD	1.5
SR SHORE (B)	4.0
INSTRUCTOR TOUR	4.0
SHORE CAPT STAFF (B)	3.0
SHORE CAPT STAFF (C)	3.5

TABLE A-5 HELO PILOT (131X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SQUADRON TOUR	3.0
1ST SHORE TOUR	3.0
LT SEA TOUR	2.0
FRS	0.5
DEPT HEAD TOUR	2.5
JR SVC COL	1.0
LCDR SHORE TOUR (A)	3.0
LCDR JOINT TOUR	2.0
NONSCREEN SEA TOUR	2.0
FRS	0.5
XO TOUR	1.0
CO TOUR	1.0
CDR SHORE TOUR (A)	2.0
XO/CO FOLLOW SEA TOUR	2.0
SR SVC COL (A)	1.0
CDR JOINT TOUR (A)	3.0
CDR JOINT TOUR (B)	2.0
CDR SHORE (B)	3.0
MAJOR SEA COMMAND	2.0
CAPT SHORE TOUR	3.0
SR SVC COL (C)	1.0
CAPT JOINT TOUR	3.0
SEQ SEA COMMAND	2.0
INSTRUCTOR TOUR	2.5

TABLE A-6 JET NFO (132X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SQUADRON TOUR	3.0
1ST SHORE TOUR	3.0
LT SEA TOUR	2.0
FRS	0.5
DEPARTMENT HEAD TOUR	2.0
LCDR SHORE TOUR (A)	3.0
JR SVC COL (A)	1.0
JOINT TOUR (A)	2.0
LCDR SHORE TOUR (B)	2.0
FRS	0.5
SQUADRON XO	1.5
SQUADRON CO	1.5
NONSCREEN CDR SEA TOUR	2.5
CV DEPARTMENT HEAD	2.0
SR SVC COL (CDR)	1.0
CDR JOINT TOUR	3.0
MAJOR SEA COMM	2.0
SENIOR SHORE (A)	3.0
CAPT SR SVC COL	1.0
SR SHORE (B)	3.0
SEQ. CMD	2.0
CAPT JOINT TOUR	3.0
SR SHORE (C)	3.0
INSTRUCTOR TOUR	3.0
NONSCREEN CDR SHORE TOUR	2.0

TABLE A-7 PROP NFO (132X)

CAREER PATH/TOURS	TOUR LENGTH
1ST SQUADRON TOUR	3.0
1ST SHORE TOUR	2.0
LT SEA TOUR (A)	2.5
LT SECOND SHORE TOUR	2.0
FRS	0.5
DEPARTMENT HEAD TOUR (B)	3.0
DEPARTMENT HEAD TOUR (A)	2.0
LCDR SHORE TOUR (A)	2.5
LCDR SHORE TOUR (B)	3.0
JR SVC COL (A)	1.0
LCDR JOINT TOUR	2.0
LCDR SHORE TOUR	2.0
NONSCREEN CDR SEA TOUR	2.0
FRS	0.5
SQUADRON XO	1.0
SQUADRON CO	1.0
NAVAL STATION TOUR	1.5
CDR SEA TOUR	2.0
SR SVC COL (CDR)	1.0
CDR JOINT TOUR (B)	2.0
SEA STAFF	2.0
CDR JOINT TOUR (A)	3.0
SENIOR SHORE (A)	2.0
MAJOR SEA COMM	2.0
SHORE CAPT STAFF (A)	2.0
CAPT JOINT TOUR (A)	2.0
CAPT SR SVC COL	1.0
CAPT SHORE TOUR (B)	3.0
SEQ. CMD	1.5
CAPT JOINT TOUR (B)	3.0
INSTRUCTOR TOUR	3.0
CAPT SHORE TOUR (C)	3.0

APPENDIX B

BASE TRANSITION PROBABILITIES

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 1

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG											
2. DISCRT SEA		0.32	0.07	0.34	0.01			0.02	0.01	0.02	
3. DISCRT SHR		0.80									
4. 1300 BILLET		0.61	0.14							0.03	
5. 1050 (111X)											
6. 1050 (112X)											
7. 1050 (131/2)											
8. 1000 (111/6)		0.80									
9. 1000 (112/7)		0.80									
10. 1000 (13XX)		0.33	0.08	0.36						0.02	
11. 1000 (1100)											0.80

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 2

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG											
2. DISCRT SEA	0.19	0.15	0.07	0.25	0.01			0.04		0.01	
3. DISCRT SHR	0.23	0.18		0.31							
4. 1300 BILLET	0.20	0.16	0.07	0.27						0.01	
5. 1050 (111X)	0.40	0.32									
6. 1050 (112X)	0.40	0.32									
7. 1050 (131/2)	0.23	0.18		0.31							
8. 1000 (111/6)	0.40	0.32									
9. 1000 (112/7)	0.40	0.32									
10. 1000 (13XX)	0.23	0.18		0.31							
11. 1000 (1100)	0.18										0.54

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 3

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.23	0.21	0.08	0.34							0.13
2. DISCRT SEA	0.13	0.12	0.05	0.19			0.01	0.02		0.01	
3. DISCRT SHR	0.16	0.14		0.23							
4. 1300 BILLET	0.14	0.12	0.05	0.20			0.01			0.02	
5. 1050 (111X)	0.28	0.25									
6. 1050 (112X)	0.28	0.25									
7. 1050 (131/2)	0.14	0.13	0.05	0.21							
8. 1000 (111/6)	0.28	0.25									
9. 1000 (112/7)	0.28	0.25									
10. 1000 (13XX)	0.14	0.13	0.05	0.21							
11. 1000 (1100)	0.19										0.34

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 4

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.20	0.29	0.05	0.35							0.11
2. DISCRT SEA	0.16	0.24	0.04	0.30			0.01	0.02		0.02	
3. DISCRT SHR	0.16	0.24	0.04	0.30			0.01	0.02		0.02	
4. 1300 BILLET	0.17	0.26	0.05	0.31			0.01			0.02	
5. 1050 (111X)	0.28	0.41	0.08					0.04			
6. 1050 (112X)											
7. 1050 (131/2)	0.17	0.26	0.05	0.31			0.01			0.02	
8. 1000 (111/6)	0.28	0.41	0.08					0.04			
9. 1000 (112/7)	0.29	0.43	0.08								
10. 1000 (13XX)	0.17	0.26	0.05	0.31							0.34
11. 1000 (1100)	0.28										

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 5

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.15	0.28	0.08	0.30	0.01		0.02	0.02	0.01	0.07	0.06
2. DISCRT SEA	0.16	0.28	0.08	0.30	0.01		0.02	0.02	0.01	0.07	
3. DISCRT SHR	0.16	0.28	0.08	0.30	0.01		0.02	0.02	0.01	0.07	
4. 1300 BILLET	0.16	0.29	0.08	0.32			0.02			0.07	
5. 1050 (111X)											
6. 1050 (112X)											
7. 1050 (131/2)	0.16	0.29	0.08	0.32			0.02			0.07	
8. 1000 (111/6)	0.27	0.49	0.13		0.02			0.03			
9. 1000 (112/7)	0.28	0.51	0.14						0.01		
10. 1000 (13XX)		0.16	0.29	0.08	0.32			0.02		0.07	
11. 1000 (1100)	0.28										0.66

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 6

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.17	0.26	0.08	0.30	0.01		0.02	0.02	0.01	0.07	0.06
2. DISCRT SEA	0.17	0.26	0.08	0.30	0.01		0.02	0.02	0.01	0.08	
3. DISCRT SHR	0.07	0.26	0.08	0.30	0.01		0.02	0.02	0.01	0.08	
4. 1300 BILLET	0.18	0.27	0.08	0.31			0.02			0.08	
5. 1050 (111X)	0.30	0.45	0.13		0.01			0.04			
6. 1050 (112X)											
7. 1050 (131/2)	0.18	0.27	0.08	0.31			0.02			0.08	
8. 1000 (111/6)	0.30	0.45	0.13		0.01			0.04			
9. 1000 (112/7)	0.31	0.47	0.14						0.01		
10. 1000 (13XX)	0.18	0.27	0.08	0.31			0.02			0.08	
11. 1000 (1100)	0.24										0.70

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 7

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.11	0.18	0.14	0.30	0.01	0.01	0.03	0.03	0.03	0.09	0.06
2. DISCRT SEA	0.11	0.18	0.14	0.30	0.01	0.01	0.03	0.03	0.03	0.09	
3. DISCRT SHR	0.11	0.18	0.14	0.30	0.01	0.01	0.03	0.03	0.03	0.09	
4. 1300 BILLET	0.12	0.20	0.15	0.33			0.03			0.10	
5. 1050 (111X)	0.22	0.35	0.27		0.03			0.06			
6. 1050 (112X)											
7. 1050 (131/2)	0.12	0.20	0.15	0.33			0.03			0.10	
8. 1000 (111/6)	0.22	0.35	0.27		0.03			0.06			
9. 1000 (112/7)	0.22	0.35	0.27			0.02			0.06		
10. 1000 (13XX)	0.12	0.20	0.15	0.33			0.03			0.10	
11. 1000 (1100)	0.31										0.61

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 8

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.13	0.22	0.18	0.17	0.04		0.04	0.08	0.01	0.08	0.05
2. DISCRT SEA	0.13	0.22	0.18	0.17	0.04		0.04	0.08	0.01	0.07	
3. DISCRT SHR	0.13	0.22	0.18	0.17	0.04		0.04	0.08	0.01	0.07	
4. 1300 BILLET	0.15	0.25	0.21	0.19			0.04			0.09	
5. 1050 (111X)	0.19	0.31	0.26		0.05			0.12			
6. 1050 (112X)	0.23	0.37	0.32						0.02		
7. 1050 (131/2)	0.15	0.25	0.21	0.19			0.04			0.09	
8. 1000 (111/6)	0.12	0.31	0.26		0.05			0.12			
9. 1000 (112/7)	0.23	0.37	0.32						0.02		
10. 1000 (13XX)	0.15	0.25	0.21	0.19			0.04			0.09	
11. 1000 (1100)	0.26										0.69

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 9

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.24	0.27	0.15	0.10	0.05		0.02	0.10		0.06	0.02
2. DISCRT SEA	0.11	0.12	0.07	0.05	0.02		0.01	0.05		0.02	
3. DISCRT SHR	0.11	0.12	0.07	0.05	0.02		0.01	0.05		0.02	
4. 1300 BILLET	0.13	0.15	0.08	0.06			0.01			0.03	
5. 1050 (111X)	0.14	0.15	0.08		0.03			0.06			
6. 1050 (112X)											
7. 1050 (131/2)	0.13	0.15	0.08	0.06			0.01			0.03	
8. 1000 (111/6)	0.14	0.15	0.08		0.03			0.06			
9. 1000 (112/7)	0.17	0.19	0.10								
10. 1000 (13XX)	0.13	0.15	0.08	0.06			0.01			0.03	
11. 1000 (1100)	0.03										0.42

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 10

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.14	0.26	0.16	0.16	0.05		0.03	0.12		0.06	0.02
2. DISCRT SEA	0.05	0.10	[illegible]	0.06	0.02		0.01	0.05		0.02	
3. DISCRT SHR	0.05	0.10	0.06	0.06	0.02		0.01	0.05		0.02	
4. 1300 BILLET	0.06	0.12	0.08	0.07			0.01			0.03	
5. 1050 (111X)	0.07	0.14	0.08		0.03			0.06			
6. 1050 (112X)											
7. 1050 (131/2)	0.06	0.12	0.08	0.07			0.01			0.03	
8. 1000 (111/6)	0.07	0.14	0.08		0.03			0.06			
9. 1000 (112/7)											
10. 1000 (13XX)	0.06	0.12	0.08	0.07			0.01			0.03	
11. 1000 (1100)	0.05										0.33

APPENDIX C

ALTERNATE TRANSITION PROBABILITIES

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 1

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG											
2. DISCRT SEA		0.50	0.05	0.18	0.01	0.01	0.01	0.01	0.01	0.01	
3. DISCRT SHR		0.80									
4. 1300 BILLET		0.72	0.05							0.01	
5. 1050 (111X)											
6. 1050 (112X)											
7. 1050 (131/2)											
8. 1000 (111/6)		0.80									
9. 1000 (112/7)		0.80									
10. 1000 (13XX)		0.86	0.06	0.86						0.01	
11. 1000 (1100)											0.80

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 2

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG											
2. DISCRT SEA	0.25	0.25	0.10	0.06	0.01	0.01	0.01	0.01	0.01	0.01	
3. DISCRT SHR	0.07	0.40		0.25							
4. 1300 BILLET	0.05	0.30	0.10	0.25						0.01	
5. 1050 (111X)	0.22	0.50									
6. 1050 (112X)	0.22	0.50									
7. 1050 (131/2)	0.22	0.25		0.25							
8. 1000 (111/6)	0.22	0.50									
9. 1000 (112/7)	0.22	0.50									
10. 1000 (13XX)	0.22	0.25		0.25							
11. 1000 (1100)	0.18										0.54

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 3

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.25	0.85	0.06	0.20							0.13
2. DISCRT SEA	0.15	0.15	0.05	0.15			0.01	0.01		0.01	
3. DISCRT SHR	0.20	0.20		0.13							
4. 1300 BILLET	0.20	0.20	0.06	0.06			0.01			0.01	
5. 1050 (111X)	0.26	0.27									
6. 1050 (112X)	0.26	0.27									
7. 1050 (131/2)	0.20	0.20	0.06	0.07							
8. 1000 (111/6)	0.26	0.27									
9. 1000 (112/7)	0.26	0.27									
10. 1000 (13XX)	0.20	0.20	0.06	0.07							
11. 1000 (1100)	0.19										0.34

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 4

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.25	0.35	0.05	0.24							0.11
2. DISCRT SEA	0.25	0.25	0.01	0.24			0.01	0.01	0.01	0.01	
3. DISCRT SHR	0.25	0.25	0.01	0.24			0.01	0.01	0.01	0.01	
4. 1300 BILLET	0.25	0.25	0.05	0.20			0.01			0.01	
5. 1050 (111X)	0.30	0.45	0.05					0.01			
6. 1050 (112X)											
7. 1050 (131/2)	0.25	0.30	0.05	0.20			0.01			0.01	
8. 1000 (111/6)	0.30	0.45	0.05					0.01			
9. 1000 (112/7)	0.34	0.45	0.01						0.01		
10. 1000 (13XX)	0.25	0.30	0.05	0.20			0.01			0.01	
11. 1000 (1100)	0.28										0.52

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 5

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.15	0.35	0.04	0.30	0.01	0.01	0.01	0.01	0.01	0.05	0.06
2. DISCRT SEA	0.15	0.35	0.05	0.30	0.01	0.01	0.01	0.01	0.01	0.05	
3. DISCRT SHR	0.15	0.35	0.05	0.30	0.01	0.01	0.01	0.01	0.01	0.05	
4. 1300 BILLET	0.17	0.30	0.01	0.40			0.01			0.05	
5. 1050 (111X)											
6. 1050 (112X)											
7. 1050 (131/2)	0.17	0.30	0.01	0.40			0.01			0.05	
8. 1000 (111/6)	0.35	0.55	0.02		0.01			0.01			
9. 1000 (112/7)	0.36	0.56	0.01						0.01		
10. 1000 (13XX)	0.17	0.30	0.01	0.40			0.01			0.05	
11. 1000 (1100)	0.28										0.66

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 6

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.15	0.40	0.04	0.25	0.01	0.01	0.01	0.01	0.01	0.05	0.06
2. DISCRT SEA	0.25	0.30	0.05	0.25	0.01	0.01	0.01	0.01	0.01	0.05	
3. DISCRT SHR	0.25	0.30	0.05	0.25	0.01	0.01	0.01	0.01	0.01	0.05	
4. 1300 BILLET	0.20	0.33	0.05	0.30			0.01			0.05	
5. 1050 (111X)	0.30	0.50	0.10		0.01			0.02			
6. 1050 (112X)											
7. 1050 (131/2)	0.20	0.33	0.05	0.30			0.01			0.05	
8. 1000 (111/6)	0.30	0.50	0.10		0.01			0.02			
9. 1000 (112/7)	0.30	0.52	0.10						0.01		
10. 1000 (13XX)	0.20	0.33	0.05	0.30			0.01			0.05	
11. 1000 (1100)	0.24										0.70

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 7

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.10	0.30	0.15	0.28	0.01	0.01	0.01	0.01	0.01	0.05	0.06
2. DISCRT SEA	0.10	0.30	0.15	0.28	0.01	0.01	0.01	0.01	0.01	0.05	
3. DISCRT SHR	0.10	0.30	0.15	0.28	0.01	0.01	0.01	0.01	0.01	0.05	
4. 1300 BILLET	0.15	0.30	0.10	0.32			0.01			0.05	
5. 1050 (111X)	0.25	0.45	0.21		0.01			0.01			
6. 1050 (112X)											
7. 1050 (131/2)	0.15	0.30	0.10	0.32			0.01			0.05	
8. 1000 (111/6)	0.25	0.45	0.21		0.01			0.01			
9. 1000 (112/7)	0.30	0.40	0.20			0.01			0.01		
10. 1000 (13XX)	0.15	0.30	0.10	0.32			0.01			0.05	
11. 1000 (1100)	0.31										0.61

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 8

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.15	0.35	0.20	0.15	0.01	0.01	0.01	0.01	0.01	0.05	0.05
2. DISCRT SEA	0.15	0.35	0.20	0.15	0.01	0.01	0.01	0.01	0.01	0.04	
3. DISCRT SHR	0.15	0.35	0.20	0.15	0.01	0.01	0.01	0.01	0.01	0.04	
4. 1300 BILLET	0.15	0.35	0.20	0.17			0.01			0.05	
5. 1050 (111X)	0.20	0.47	0.20		0.01			0.05			
6. 1050 (112X)	0.30	0.43	0.20						0.01		
7. 1050 (131/2)	0.15	0.35	0.20	0.17			0.01			0.05	
8. 1000 (111/6)	0.20	0.47	0.20		0.01			0.05			
9. 1000 (112/7)	0.30	0.43	0.20						0.01		
10. 1000 (13XX)	0.15	0.35	0.20	0.17			0.01			0.05	
11. 1000 (1100)	0.26										0.69

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 9

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.25	0.30	0.10	0.10	0.01	0.01	0.01	0.05	0.01	0.05	0.02
2. DISCRT SEA	0.10	0.15	0.10	0.04	0.01	0.01	0.01	0.01	0.01	0.01	
3. DISCRT S	0.10	0.15	0.10	0.04	0.01	0.01	0.01	0.01	0.01	0.01	
4. 1300 BILLET	0.13	0.15	0.10	0.06			0.01			0.01	
5. 1050 (111X)	0.20	0.20	0.04		0.01			0.01			
6. 1050 (112X)											
7. 1050 (131/2)	0.13	0.15	0.10	0.06			0.01			0.01	
8. 1000 (111/6)	0.20	0.20	0.04		0.01			0.01			
9. 1000 (112/7)	0.17	0.24	0.05								
10. 1000 (13XX)	0.13	0.15	0.10	0.06			0.01			0.01	
11. 1000 (1100)	0.03										0.42

CURRENT TRANSFER RATES WHEN LEAVING TOUR NUMBER 10

ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11
1. ED/TRNG	0.15	0.35	0.15	0.09	0.01	0.01	0.01	0.05	0.01	0.05	0.02
2. DISCRT SEA	0.05	0.16	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	
3. DISCRT SHR	0.05	0.16	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	
4. 1300 BILLET	0.05	0.20	0.05	0.05			0.01				
5. 1050 (111X)	0.10	0.20	0.06		0.01			0.01			
6. 1050 (112X)											
7. 1050 (131/2)	0.05	0.20	0.05	0.05			0.01				
8. 1000 (111/6)	0.10	0.20	0.06		0.01			0.01			
9. 1000 (112/7)											
10. 1000 (13XX)	0.05	0.20	0.05	0.05			0.01				
11. 1000 (1100)	0.05										0.33

GLOSSARY

Balanced Force: a model/methodology utilized by OP-13/PERS-4 in officer manpower planning and distribution.

billet: a duty position categorized by associated title, description, rank, skill, and experience level required.

Billet Designator (Code): four-digit number used to identify the primary naval specialty qualifications required of the billet incumbent and to administratively categorize officer billets for proper management and identification. They serve as manpower management tools when used in conjunction with the Officer Designator Code. The Billet Designator indicates the category of officer required for a billet.

(designator-)discrete billet: a billet which requires that at least the first three digits of the billet designator code be matched with the officer designator of an individual filling the billet.

DMDC: Defense Manpower Data Center; branch office located in Monterey, CA.

General URL (Gen URL): General Unrestricted Line Officer; an Officer with a designator of "110X", possessing no specific warfare specialty.

generalist billet: a billet having a billet designator of either 1050 or 1000 (see INTRODUCTION, pg 3).

NMP-O: Navy Manpower Plan for Officers; a model/methodology utilized by OP-13/NMPC-4 in officer manpower planning and distribution.

Officer Designator (Code): four-digit number used to group officers by categories for personnel accounting and administrative purposes and to identify the status of officers. The first three digits identify the specific category in which the officer is appointed and/or designated; the fourth digit identifies the status of the officer within the category.

130X officer designator: an URL officer who is a member of the aeronautical community and whose rating as a pilot or NFO has been terminated. These officers may be assigned to 1000, 1050, 1300, 1310, or 1320 designated billets, if otherwise qualified.

OMF: Officer Master File; a file consisting of one record of detailed information for each officer in the Navy.

PDS: past duty station; a counter utilized in the Officer Master File (OMF) for determining the present tour number of an officer.

PRD: projected rotation date; a time-frame during which an officer is expected to change billets.

Restricted Line: Officers who are restricted in the performance of their duty by having been designated an Engineering Duty officer, Aeronautical Engineering Duty officer, or Special Duty officer (Cryptology, Intelligence, Public Affairs, Oceanography, etc.).

Staff Corps: Officers serving in any of the following:

(1) Medical Corps
(2) Dental Corps
(3) Medical Service Corps
(4) Nurse Corps
(5) Civil Engineer Corps
(6) Supply Corps
(7) Chaplain Corps
(8) Judge Advocate General Corps
(9) Health Care Professional

TAR: Training and Administering Reserves; Reserve personnel retained on active duty and designated to perform duties in connection with training and administering reserve components.

Total Authorized Billets: the number of billets Congress has legislated for the Navy.

trainee: an officer in training for a warfare specialty designator; they include 116X (surface), 117X (submarine), 137X (aviation-pilot), and 139X (aviation-NFO).

URL: Unrestricted Line Officer; an officer not restricted in the performance of duty, as compared to Restricted Line and Staff Corps officers.

warfare designator: an officer designator which demonstrates that an officer has completed the necessary training and qualifications and is proficient in a warfare specialty such as surface, sub-surface, or air warfare.

warfare specialist: an officer who has completed the necessary training and qualifications and is proficient in a warfare specialty such as surface, sub-surface, or air warfare.

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